February, 1932

Railway Engineering and Maintenance

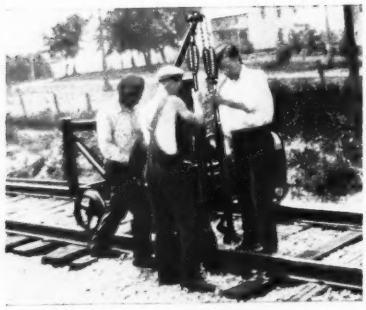
DURING WINTER STORMS PREPARE FOR SUMMER WORK

THE MARCH ISSUE

Fourteenth Annual Equipment Economy Number

The Years Review of Progress in the Mechanization of Maintenance Work — In Advertising and Editorial Pages Alike

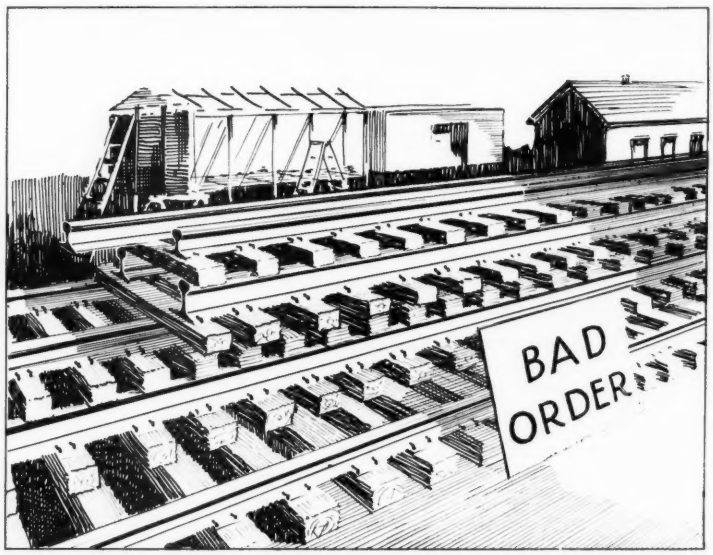
Nordberg Power Jack



Nordberg Spike Puller

Nordberg Rail Drill

Nordberg Adzing Machine



You Can't Store "Bad Order" Track on a Siding

Because of the surplus of cars under present traffic conditions, "Bad Order" cars can be taken out of service and stored on dead sidings.

Not so with "Bad Order" main track. It can't be taken out of service. It must be kept in better shape than ever before. Higher track standards are demanded today. Faster speed with safety and improved service are the factors which counteract the competition of other methods of transportation.

There is a bright side to this problem—the cost of a normal maintenance program has been tremendously reduced by Nordberg Track Machinery—Power Jacks, Tie Adzing Machines, Spike Pullers, Rail Drills, Grinders, etc.

Let us tell more of their possibilities. How they will provide better track at lower cost.

Railway Equipment Department

NORDBERG MFG. CO.

MILWAUKEE WISCONSIN

NORDBERG

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 2200 Port Washington Road, Milwaukee, Wisconsin. Subscription price: United States and Mexico, $2.00; Canada, $2.50 including duty; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter February 14, 1931, at the postoffice at Milwaukee, Wisconsin, under the Act of March 3, 1879.

WHAT

is the Purpose of a Tie Plate

Is it not to Protect Ties from Mechanical Wear

Then why is not Design the Most Important Requisite of a Tie Plate

REAL tie protection is determined by tie plate design. Nothing else. All other qualifications are secondary. Service in track is what counts and that service should be measured by the ability of the plate to protect ties against mechanical wear.

The Lundie is the one tie plate that holds track to perfect gauge without the use of destructive projections which ordinarily ruin ties and defeat their very purpose. Its design prevents mechanical wear and insures maximum return on cross tie investments.

You can have this real tie protection at no increased cost.

The Lundie Engineering Corporation

285 Madison Avenue, New York
59 East Van Buren Street, Chicago

LUNDIE TIE PLATE

ARMCO'S *New* GIANT

Super-Size Super-Strength Super-Service

FILLING present day demands for economy, Armco Multi-Plate Pipe has won immediate favor with railroad officials, engineers and maintenance men.

It is the last word in safe large diameter pipe.

Only Armco can offer it.

Armco Multi-Plate Pipe is a custom-built product in sizes from 60 inches up to 10 feet and more in diameter.

Punched, formed to shape, and galvanized in the factory, the Armco Ingot Iron plates used in this pipe come "nested" to the job ready for quick assembly.

Erected, it forms a firmly connected, continuous pipe with qualities of super-strength which meet the strictest requirements.

Let us tell you about installations already completed and others now in process of completion.

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

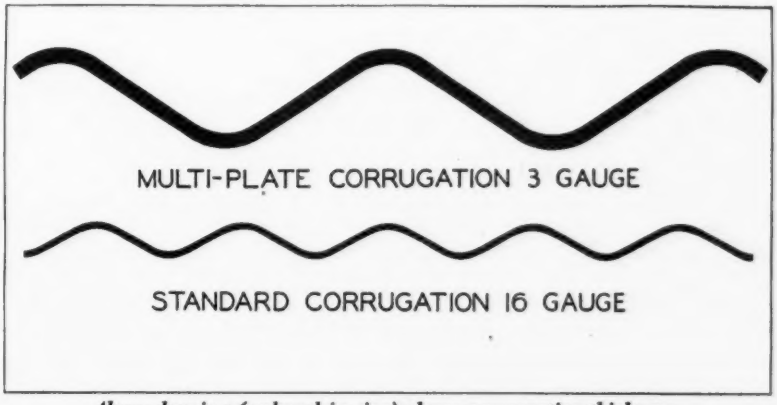
ARMCO CULVERT MANUFACTURERS ASS'N

HEAVY-DUTY PIPE . .

Here's Why
The GREATER STRENGTH
The GREATER DURABILITY

CORRUGATIONS are more than twice as wide and three times as deep. Armco Ingot Iron plates are four times as thick as standard 16 gauge. That's why Armco Multi-Plate Pipe sets new standards for greater strength and durability.

Another advantage is this: where excessive service may be expected in the invert, heavier gauges may be used than in the upper circumference. This again illustrates the custom-built feature of Armco Multi-Plate Pipe for large culvert jobs, arch relining, trestle replacements, etc. Let us tell you more about it.



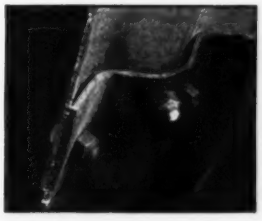
Above drawing (reduced in size) shows comparative thickness of 16 and 3 gauge plates

Uppermost—Its ECONOMY

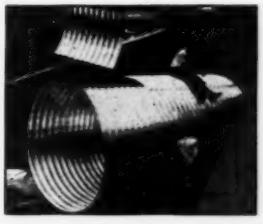
Figured against every other practical type of structure, Armco Multi-Plate Pipe actually saves hundreds, often thousands of dollars.

Quick installation, minimum of equipment and labor and ease of handling contribute to *savings never before possible* in this size structure.

Get the facts about Armco Multi-Plate Pipe. Mail the coupon today for complete information.



Showing small section of joint



Erecting section of 90" Multi-Plate Pipe

Erecting section of Multi-Plate Pipe under railroad

105" Multi-Plate Pipe under traction line in Ohio

ARMCO
MULTI-PLATE
PIPE

MIDDLETOWN, OHIO

Gentlemen: Send me at once facts and complete data on ARMCO MULTI-PLATE PIPE.

Name.....

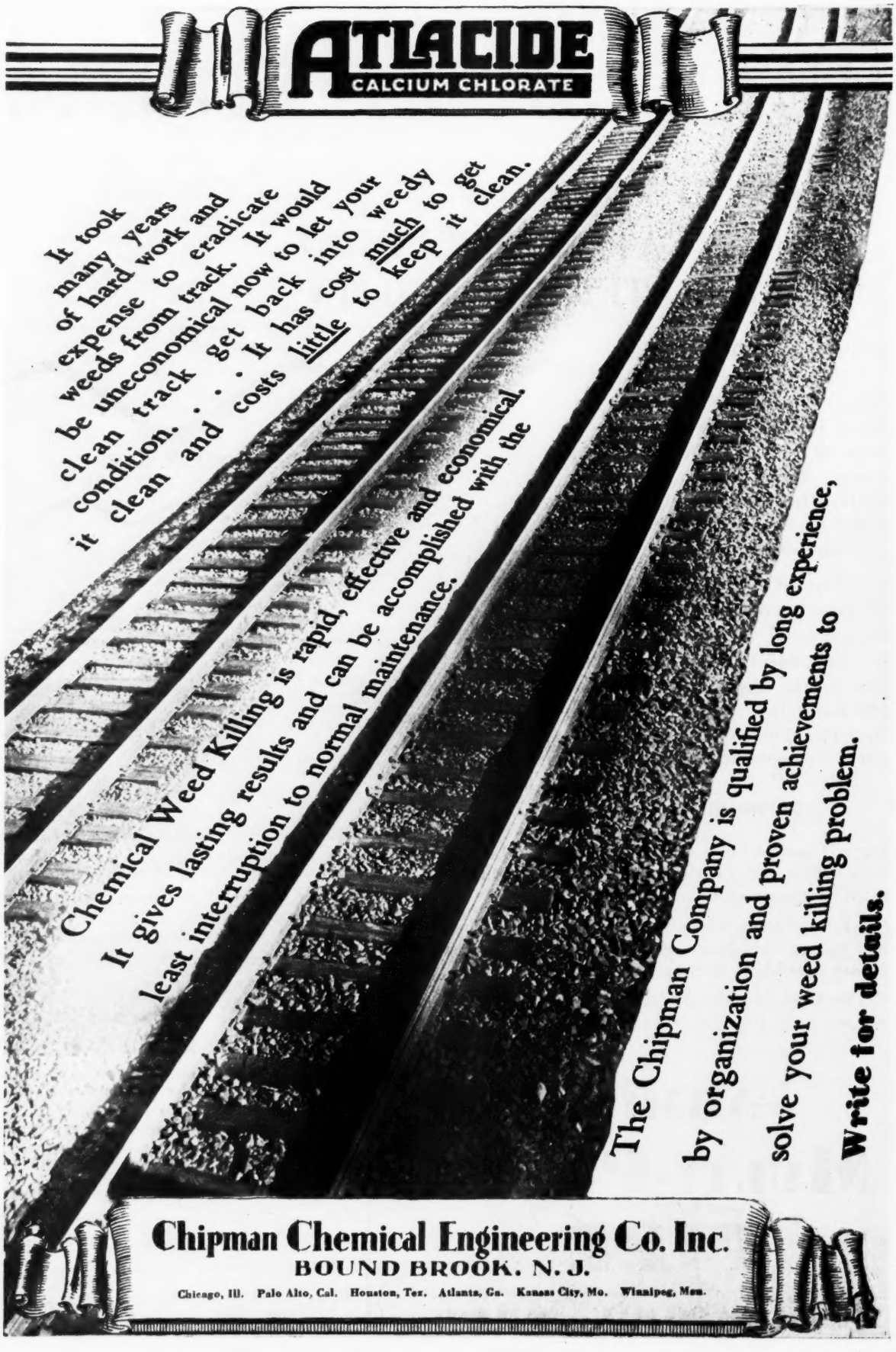
Title.....

Road.....

Address.....

City.....

REM 2


ATLACIDE
CALCIUM CHLORATE
It took many years of hard work and expense to eradicate weeds from track. It would be uneconomical now to let your clean track get back into weedy condition. . . It has cost much to get it clean and costs little to keep it clean.
Chemical Weed Killing is rapid, effective and economical. It gives lasting results and can be accomplished with the least interruption to normal maintenance.
The Chipman Company is qualified by long experience, by organization and proven achievements to solve your weed killing problem.
Write for details.
Chipman Chemical Engineering Co. Inc.
BOUND BROOK, N. J.
Chicago, Ill. Palo Alto, Cal. Houston, Tex. Atlanta, Ga. Kansas City, Mo. Winnipeg, Man.

CUT AWAY your overburden

— not just the *dirt* burden that overlies your gravel deposits, but also the *cost* burden that overlies your maintenance.

Do it like the Oregon-Washington Railroad & Navigation Company has done it, with the efficiency and wide usefulness of a Bucyrus-Erie caterpillar-mounted excavator.

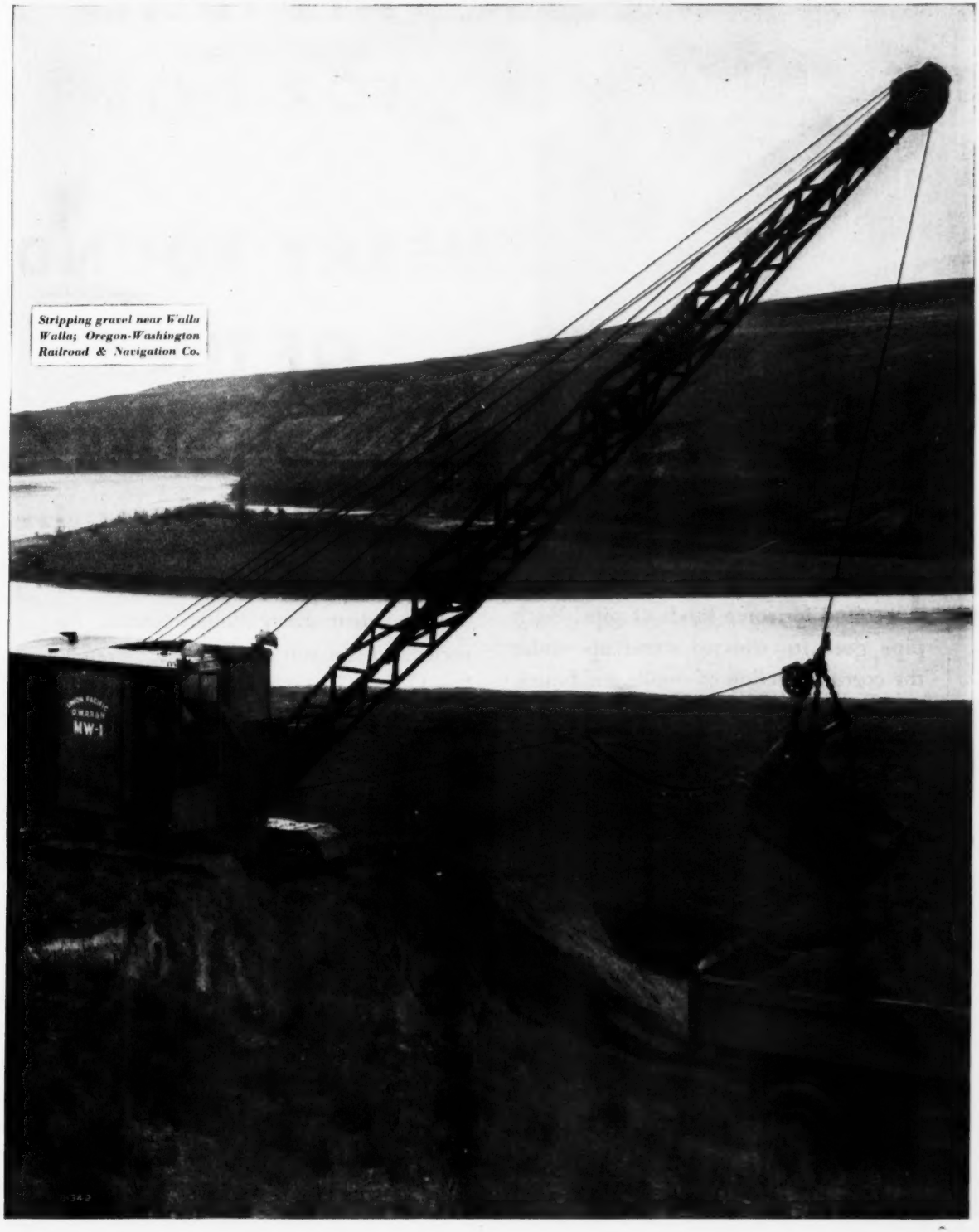
Bucyrus-Eries are mobile, easy to move over the line, quickly convertible from dragline to crane, clamshell or shovel. They do more work per month per machine, in more different locations—cover with fewer dollars the jobs that somehow will have to be done in 1932.

Every size, type and power—the most complete line. Ask us for facts. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

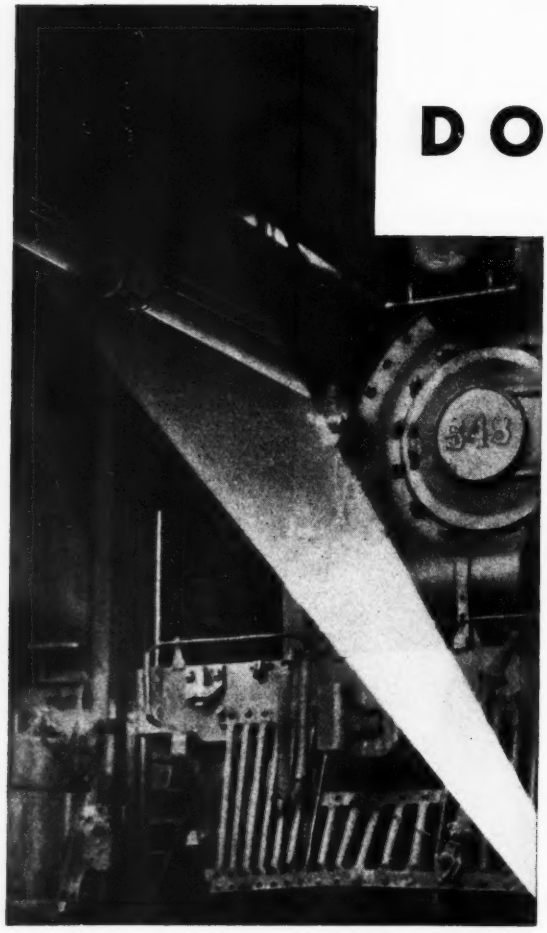
BUCYRUS ERIE

EXCAVATORS AND CRANES for every railroad need

A-459



Stripping gravel near Walla Walla; Oregon-Washington Railroad & Navigation Co.



DO YOU CALL THE TUNE FOR THIS "MERRY ROUND OF THE ROUNDHOUSE?"

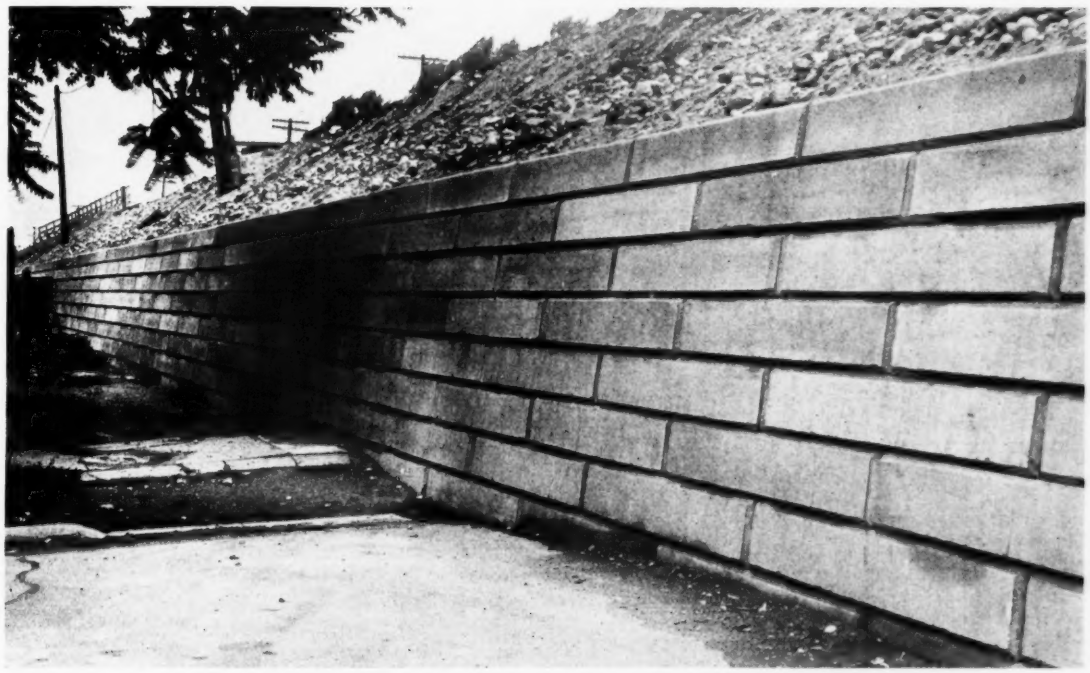
LIFE in a roundhouse is a merry-go-round for some kinds of pipe. Such pipe goes in, tries to stand up under the corrosive action of smoke and fumes, and then comes out again . . . eaten away and worthless!

If YOU select roundhouse pipe, why not be sure of getting pipe that has PROVED its resistance to rust and corrosion in railroad service? Reading Puddled Iron Pipe will stop those costly, frequent pipe repairs and replacements. It will *save more money*—and this is a time when every dollar counts. Its records of superior endurance . . . stretching back to the beginnings of modern rail transportation . . . are unmatched by any other pipe.

Reading representatives will gladly consult with you . . . will gladly show you how you can achieve true pipe economy in your own installations. Write us for information today.

READING IRON COMPANY, Philadelphia, Pa.

Science and Invention Have Never Found a Satisfactory Substitute for Genuine Puddled Iron



Federal Retaining Wall erected by Chicago & North Western R. R. for track elevation at Kenosha, Wis.
Note the sturdiness and handsome closed face appearance of this wall.

More Federal Retaining Walls Erected in 1931 Than in Any Previous Year!

Year after year, the merits of 2-piece construction have brought increasing recognition amongst railroad engineers.

During 1931 when the roads were scanning their expenditures with unusual care, they put through more Federal orders and erected more walls than in any other year of Federal history.

As permanent and stable as a poured wall, yet at one-third less cost; no maintenance expense; closed face of fine masonry-like appearance; 100% salvage value for re-location—these are some of the reasons for the marked trend toward Federal.

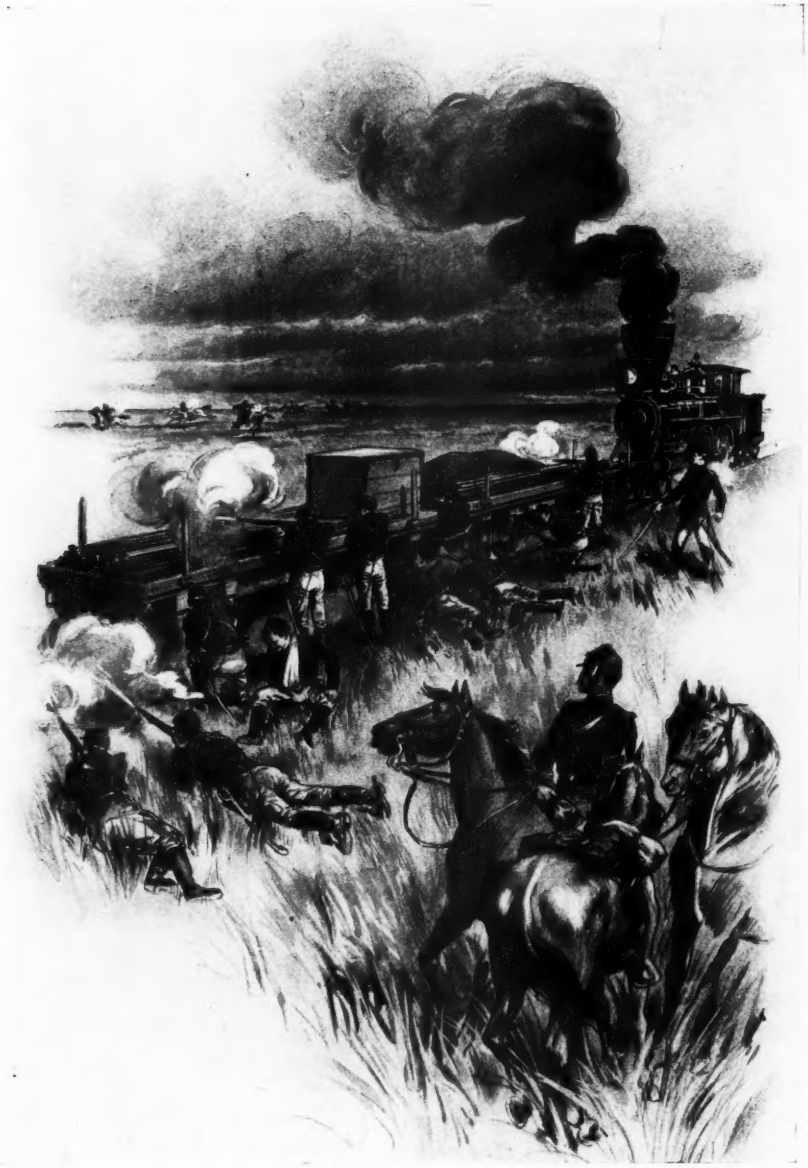
Amongst the prominent installations were B&O at Staten Island and Chicago; City of Oil City, Pa.; South Shore Dock Co., Marquette, Mich.; Allegheny County, Pa.; and many more for railroads, highways and industrial service. Complete data, estimates and sketches gladly submitted.

FEDERAL-AMERICAN CEMENT TILE CO.

Executive Offices: 608 South Dearborn Street - - - - - - - Chicago
Plants near CHICAGO - NEW YORK - PITTSBURGH - BIRMINGHAM

Concrete Products *for Over 25 Years*

FEDERAL 2 piece Concrete CRIBBING



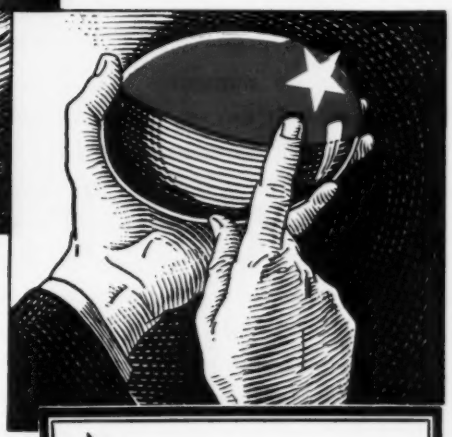
SINCE THE DAYS OF PIONEER RAILROADING
THIS TRADE MARK

HAS IDENTIFIED TRACK TOOLS OF
HIGHEST QUALITY and WORKMANSHIP

Woodings-Verona Tool Works
Verona, Pa.

IN "SAUCER TEST" RED LEAD PRIMER OUTLASTS *all others 4 to 1*

● Dutch Boy Red-Lead is a fine, highly oxidized red-lead supplied in two forms—paste and liquid. The paste comes in natural orange red, is readily mixed to brushing consistency and can be tinted to darker colors. Dutch Boy Liquid Red-Lead (ready for the brush) is available in the natural orange red, two shades each of brown and green, and also in black.



● If you've looked for proof, here it is . . . proof that pure red-lead is the durable primer for iron and steel structures! Read this brief account of an ingenious "Saucer Test" developed by the engineering staff of a southern railroad.

In this test, half of each small steel saucer is given a priming coat of Dutch Boy Red-Lead. The other half in each case is painted with one of the other paints to be tested. All saucers are filled with locomotive stack cinders and water, then placed on outdoor racks for a period of months with water added as it evaporates. The saucers are allowed to stand until the paints break down.

The "Saucer Test" offers an excellent way to test metal-protecting paints because it closely reproduces actual service conditions. The corrosive sulphuric acid reaction that takes place when cinders and moisture lodge in the webs and angles of metal structures is duplicated in the test saucers.

Scores of priming paints have been put through the "Saucer Test" by this one southern railroad. In every case . . . red-lead has outlasted every other priming paint by 4 to 1—or better! As a result, this railroad has standardized on pure red-lead for priming paint for metal structures.

Another railroad used a similar test with a salt solution to find the most durable paint for bridges exposed to brine drip from refrigerator cars. In this brine test, as in the cinder test, red-lead proved its unique value as a safeguard against rust and deterioration.

Why not make this practical, easy "Saucer Test" yourself? Prove to your own satisfaction that Dutch Boy Red-Lead will protect better against the corrosion that causes destruction. Let us send you a testing saucer and a sample of Dutch Boy Red-Lead ready for the brush, together with full directions for making the "Saucer Test". Just make your request on your company letterhead.

NATIONAL LEAD COMPANY

New York, 111 Broadway; Buffalo, 116 Oak Street; Chicago, 900 West Eighteenth Street; Cincinnati, 659 Freeman Avenue; Cleveland, 820 West Superior Avenue; St. Louis, 722 Chestnut Street; San Francisco, 2240 24th Street; Boston, National-Boston Lead Co., 800 Albany Street; Pittsburgh, National Lead & Oil Company of Pa., 316 Fourth Avenue; Philadelphia, John T. Lewis & Bros. Co., Widener Building.

Saucer used to make "Saucer Test" for paint durability. Made of steel, 5½ inches in diameter by ⅝ inch deep. Write for testing saucer and sample of red-lead. Prove to yourself that Dutch Boy Red-Lead is your property's best safeguard against rust.

"Save the surface and you save all" — Dutch Boy Red-Lead

DUTCH BOY RED-LEAD

OXWELDING *and* CUTTING *for all-around economy*

THE money-saving applications of oxy-acetylene welding and cutting are so numerous and so varied that scarcely any one man in a railroad organization can know them all.

Realizing this, railroads which are getting the most out of the oxy-acetylene process have turned for its efficient utilization to a group of specialists in railroad welding and cutting practice.

This group consists of the engineers, supervisors, and service operators of The Oxweld Railroad Service Company, an organization which has served American railroads for nineteen years. Training railroads' own employees in the best methods of welding and cutting, overseeing their work, and supplying them with the best materials and facilities, this service has proved to be of increasing value to the majority of Class I railroads, year after year.

OXWELD RAILROAD SERVICE

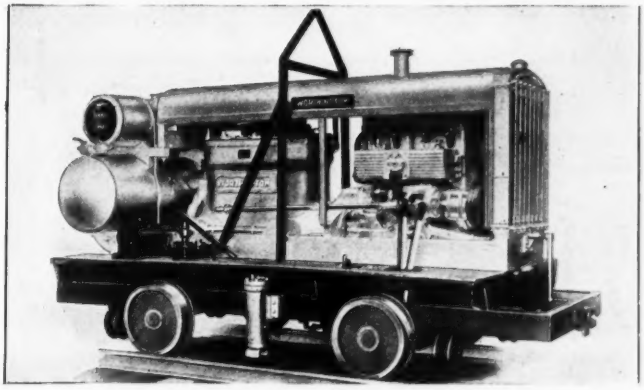
THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK, Carbide and Carbon Building
CHICAGO, Carbide and Carbon Building

THE TEN GUARDSMEN *of the* AIR KING'S PERFORMANCE



IN the Worthington Air King Compressorcar, a mechanical drive transmits power direct from the engine to the wheels . . . eliminating an air motor and reducing the burden on the compressor. Full power makes it possible to climb steep grades with ease.

And here are the ten vital points of the Worthington Compressor Unit which make it a paying investment for railroad work:

- **The famous Feather Valve**
  Steel ribbons . . . new ones cost only 20 cents. The only compressorcar using these flexible, durable valves. *This means economy.*
- **Full force feed lubrication**
  Oil under 30 lb. pressure between all wearing surfaces. No "high bearings" to burn out as with splash system. *This is protection.*
- **Rated at higher speeds**
  Made possible by force feed lubrication, by balancing the flywheel and by counterbalancing the crankshaft. *More reserve power.*
- **Electrically welded frames**
  Extra heavy rolled steel. Blow holes, casting defects or shrinkage strains not possible as with cast steel frames. *Strength and long life.*
- **Flexible coupling**
  Insures against wear should the engine become misaligned. *This is efficiency.*
- **Automatic unloading system**
  Use of separate idling butterfly gives a snap pick-up to the engine before the compressor load comes on. *This is advanced design.*
- **Heavy duty Continental Engine**
  Replacable cylinder liners make reboring and oversize pistons unnecessary. Overhead valves give surplus power. *Accessibility without dismantling.*
- **Cooling water direct from radiator**
  Cooled water from bottom of the radiator is pumped to the compressor before being passed to the engine. *This is common sense.*
- **Low discharge air temperatures**
  Straight line air discharge. The Feather Valve is directly over the piston, not offset in compressor cylinder head. *Aftercoolers unnecessary.*
- **Vibrationless**
  The crankshafts and the flywheel are accurately balanced. *This lowers maintenance.*

COMPRESSORS *Portable and Stationary*	PUMPS *Centrifugal...Steam...Power Rotary...Deep Well*
ROCK DRILLING EQUIPMENT	FEEDWATER HEATERS
Rock Drills	CONDENSERS and Auxiliaries
Contractors Air Tools	METERS *Water...Grease Oil...Gasoline*
Drill Steel and Accessories	DIESEL ENGINES
Automatic Heat Treating Machines	GAS ENGINES
Forging Furnaces	CHROMIUM PLATING
MULTI-V-DRIVES	

Literature on request

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WORTHINGTON

No. 38 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

January 28, 1932

Subject: One Cannot Afford to be Forgotten

Dear Reader:

Have you ever realized how quickly a name passes out of one's memory, especially in these days of such crowded demands for attention? I was struck with this fact a few days ago when looking through some old magazines in which my attention was directed to advertisements of products that were household necessities ten years ago but which have since been forgotten and superseded by others more aggressively promoted. Such products as Sapolio and Wool soap are characteristic of not a few supplies formerly found on the shelves of every housewife but that have since passed into oblivion as the housewives have forgotten them and no longer call for them.

Does not this evidence of the frailty of the human mind constitute a lesson as well for those who sell to the railways? When the last issue of Railway Engineering and Maintenance came to your desk, I am sure that you noted, as I did, the absence of the advertisements of companies to which we have been accustomed to turn from month to month, some for as long as 15 years without a break. I cannot help but feel that the breaking of such continuity of representation creates a void not unlike that which we experience when a friend moves to a distant city. For this reason, I cannot help but feel that representation of such continuity constitutes an investment in acquaintanceship that should not be thrust aside too lightly.

I know all too well that these are days that test one's courage. I believe also that they are days that are laying the foundation for the future success or failure of more concerns than any of us now appreciate. I hold the conviction that that company that maintains the continuity of its contacts with its clients through all the various channels will be fresh in the minds of its clients when others will be overlooked. One cannot afford to be forgotten in these days.

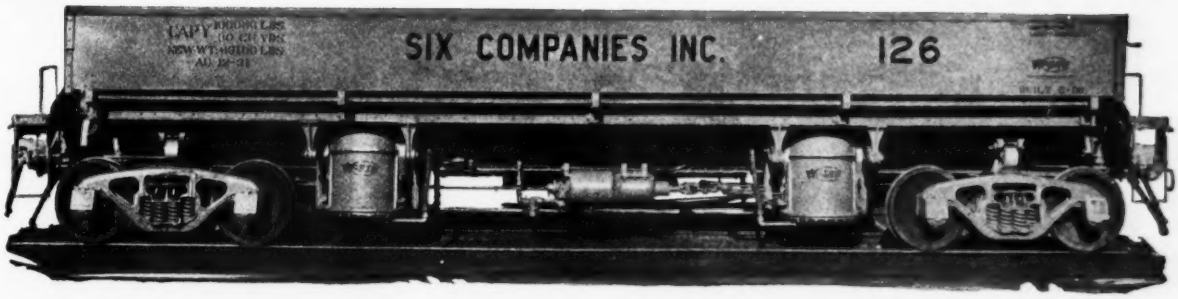
Yours truly,

Elmer T. Howson

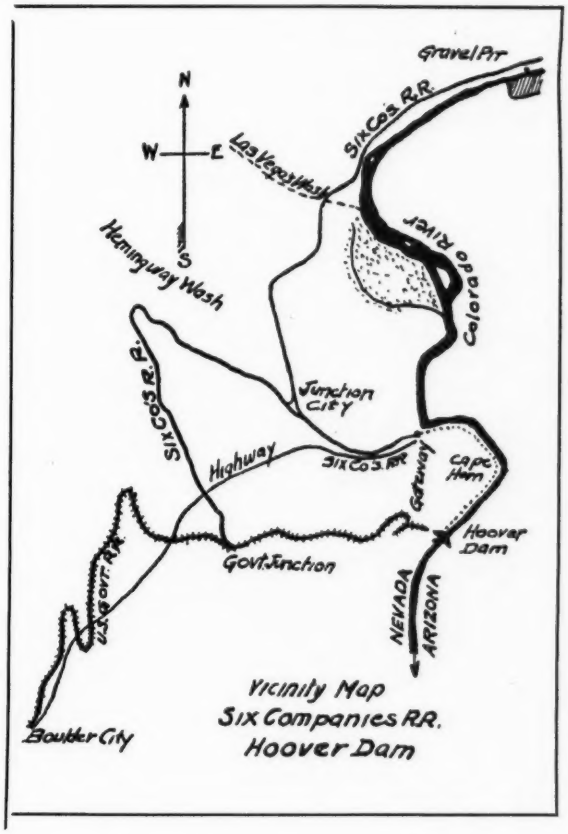
ETH*JC

Editor.

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.



50 Western Dump Cars on Hoover Dam Project



After thorough investigation, Six Companies Inc. are standardizing on Western Air Dump Cars for the great Hoover Dam Project, just as the individual companies forming that distinguished group of builders had been standardizing on Westerns for years. The severe and unusual operating conditions at Hoover Dam require the strongest and most reliable cars obtainable. Only Westerns meet the rigid requirements.

The Hoover Dam Project is the largest construction job since the Panama Canal. Western dump cars made possible the building of the Canal, and have been used on nearly every construction job of any importance since that time. The selection of Western cars for the Hoover Dam Project is further evidence of their high standard for reliability, strength and low cost operation. It is a tribute to Western's leadership in the industry.

The announcement of the selection of Western cars to handle their share of the millions of cubic yards to be moved in this enormous undertaking is made with great pride by the manufacturer.

Western Drop Door Air Dump Cars will meet the exacting requirements of railroad maintenance of way work in the same dependable way. They are built in sizes to suit the work required.

Western Wheeled Scraper Company

Pioneer Builder of Dump Cars

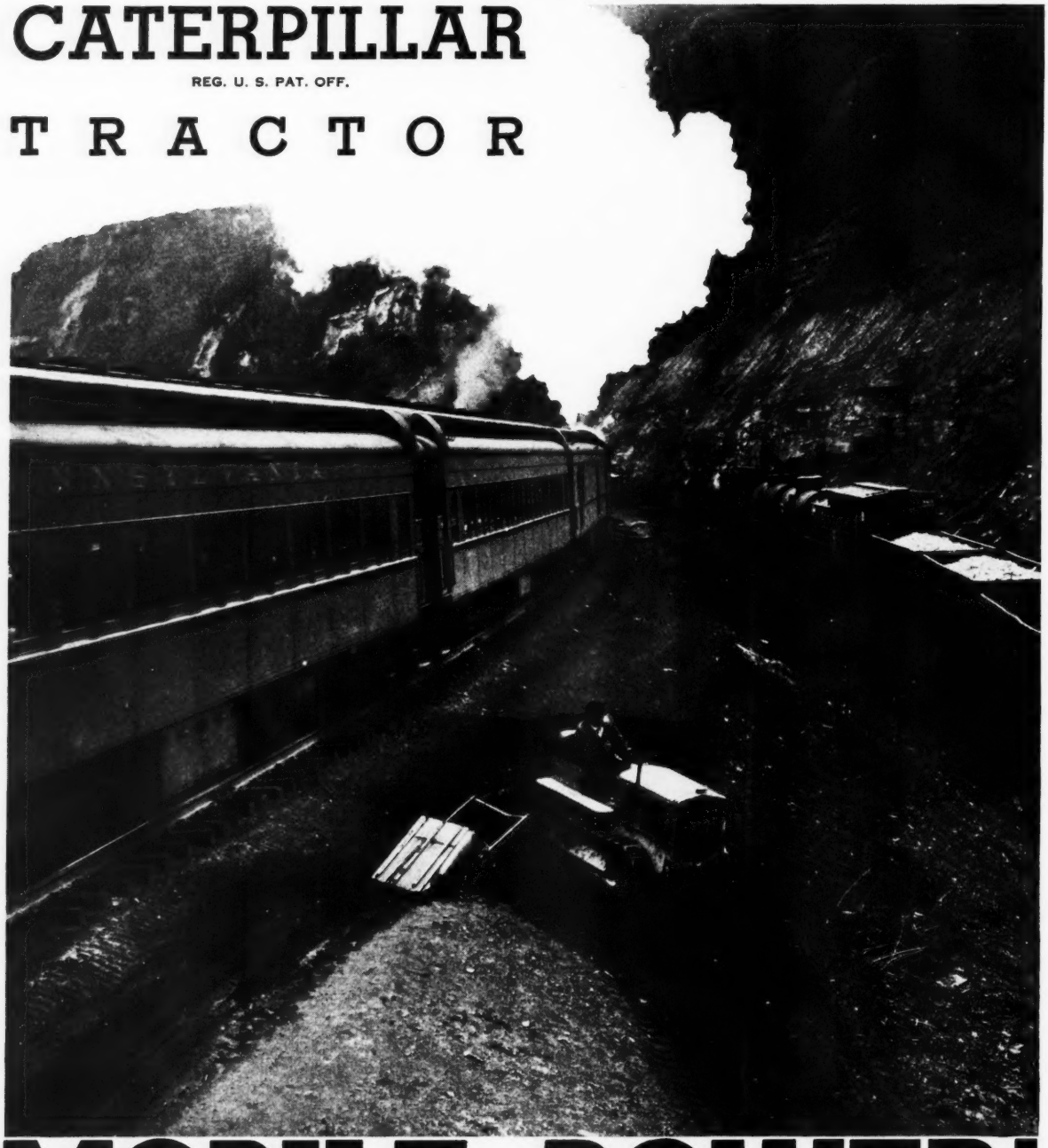
Aurora, Illinois, U.S.A.

WESTERN

CATERPILLAR

REG. U. S. PAT. OFF.

TRACTOR



MOBILE POWER!

THIS "Caterpillar" Ten track-type Tractor does away with a work train that costs $17 an hour—it is moving surplus earth preparatory to straightening switch tracks. The work train can be used only 2 hours a day—the "Caterpillar's" usefulness is limited by neither time nor weather!

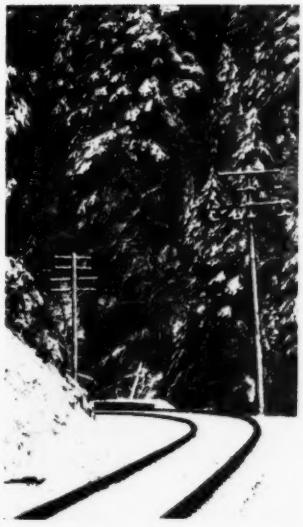
Prices—f. o. b. Peoria, Illinois

TEN	$1100	TWENTY	$1900
FIFTEEN	$1450	THIRTY	$2375
SIXTY	$4175		

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)



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Railway Engineering and Maintenance

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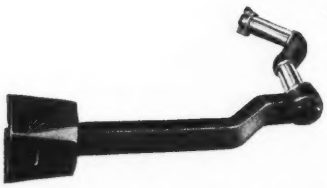
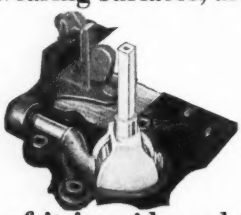
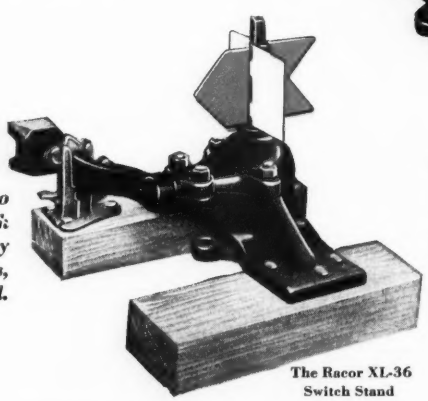
IT'S SO SIMPLE



This is the handle and shaft of the Racor XL-36 Switch Stand . . .

The lower bearing of the shaft is inserted in a roller. Fastened to the shaft by a cotter pin, the roller slides into the slot of the spindle. These members, of extra large wearing surfaces, are the only working parts and, set in the base, make  this very simple yet highly efficient mechanism. The extreme simplicity of it is evidenced in the picture. Adding the cover completes the stand.

LOST motion and trouble from wear so prevalent in ordinary low, rigid switch stands are eliminated. Designed for heavy service in yards and on main lines, where rigid switch stands are preferred.



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Railway Engineering and Maintenance

TWELVE YEARS

A Record of Achievement Under Difficulties

IN THESE days when the railways are so much before the public by reason of the difficult financial situation into which they have been forced, it is important that every employee and every other person interested in their welfare be fully informed not only as to the causes leading to their dire financial straits, but also as to the progress which they have made in perfecting their service to the public in recent years. Reference has been made in past issues to the serious effects of the competition by government-subsidized highways (February and March, 1931), and waterways (April, 1931), to the increasing demands for expenditures for highway crossings (May, 1931), to the necessity for an adequate return from the standpoints of employees, stockholders and investors (August, 1931), etc. In this issue, attention will be directed to the degree to which the railways have increased their efficiency in recent years in the face of these handicaps and the extent to which they have been rewarded therefor.

For this purpose, comparison will be made between the records for the years 1919 and 1930, the former being the last year of government operation and the last before the present Transportation Act became effective, while 1930 is the most recent year for which complete figures are available. It happens that these years were alike in that they were both periods of substantial declines in freight traffic, while the volume of freight business handled and the total earnings were about the same in these two years. Yet, in spite of these similarities between the two years, the intervening period was one of momentous changes in the railway industry, and the conditions prevailing in 1930 were vastly different from those in 1919.

Vast Service Improvement

Take the question of service. In the period between 1919 and 1930, freight business increased only 5⅓ per cent, while passenger business declined 42 per cent. In 1919 the country was in the midst of an acute car shortage. In its review of operations for that year, the Railway Age stated in its issue of January 2, 1920, that "Coal production is curtailed by a shortage of cars. Municipalities and states have appropriated funds for the greatest road building program ever inaugurated, but railway officers have stated that it will be necessary to postpone the work because sufficient freight cars are not available for carrying the material. Throughout the country the cry is for increased production. How can production be increased if freight cars are not available to haul the raw material or what would it avail if the finished product could not be distributed?"

In 1930, on the other hand, all requests for cars were filled promptly. Furthermore, thousands of additional cars were available throughout the year awaiting call. Such service is of the greatest value to shippers. It cannot be provided, however, as every railway employee knows, without increasing the empty movement of cars and adding thereby to the cost of operation. The extent of the increase in this movement is shown by the fact that the ratio of mileage made by empty freight cars to the total freight car mileage increased from 32⅓ per cent in 1919 to almost 39 per cent in 1930, and in the latter year was 26 per cent greater than in 1919.

Not only were car shortages abolished and the distribution of cars improved greatly, but the speed of the service was also increased correspondingly. The average distance that each freight car traveled daily in 1919 was 23 miles, while in 1929 it was 32.4 miles and in 1930, in spite of the decline in traffic, it was still 28.7 miles. Likewise, the average speed of freight trains in 1919 was only 10 miles per hour, while in 1930 it was 13.8.

In passenger service a 42 per cent reduction in the volume of traffic would normally be expected to lead to corresponding decreases in service. Yet, by reason of the nature of this service, only a negligible reduction was made in passenger train miles, while there was an actual increase of about 7.5 per cent in passenger car miles.

Huge Outlays for Improvements

Such an improvement in service naturally raises a question as to the manner in which it was brought about. A primary contributing factor was the improvement and enlargement of the railway plant. In 1919 the investment in railway property approximated $19,300,120,000, while in 1930 it totaled $26,051,000,000. In other words, the investment was increased $6,750,000,000, or 35 per cent in 12 years. In the same interval, the railway capitalization increased only $3,244,000,000, showing that more than two dollars was invested in the properties for every dollar of funded securities or stock that was issued. This is a record of courageous expenditure. It is no less a record of conservative financing that was equaled, in this period, by few other industries of comparable magnitude.

Such tremendous outlays for improved and enlarged plant were reflected not only in better service, as related above, but also in operating economies. In 1919 the operating expenses totaled $4,400,000,000, while in 1930

they aggregated only $3,931,000,000, a reduction of $469,000,000 . While this saving was large, the changes in the nature of these expenses were even more important. Of the total reduction mentioned, $277,500,000 was in wages and $191,500,000 in other items. As every employee knows, this reduction in the expenditure for wages was not made by lowering the rates of pay, for increases were granted practically every group of employees during this period. These increases are reflected in the trend of the average hourly rate of railway employees, which advanced from 56.5 cents in 1919 to 67.8 cents in 1930, or 20 per cent. Neither was this saving made by reducing the number of hours worked per employee appreciably, for the average number of hours worked by each employee in 1919 was 2,630 and in 1930 it was 2,527, a reduction of only 4 per cent.

The answer is that the savings were not effected at the expense of the employees in service, but by so increasing efficiency of operation as to make it unnecessary to employ so many men. Thus, the number employed in 1919 under government operation was 1,913,422, whereas in 1930 only 1,487,730 were required. The effect of this curtailment in excess man power is shown by the fact that if the railroads had employed as many persons for as many hours in 1930 as they did in 1919, and had paid them the average hourly wage rate of 1930, their total pay roll in that year would have been $961,000,000 more than it was.

What the Public Paid

With such a record of courageous expenditure for the improvement of properties and with a similar display of efficiency in increasing the productivity and the wages of the individual employees, it is fair to inquire what the public paid for this service. In 1919, it will be recalled that the railways were under government control and their net return was guaranteed. In that year, their total earnings were $5,144,795,000. If to this amount is added the deficit of about $510,000,000 which they incurred and which had to be paid by the taxpayers of the country ,and there is then subtracted the $232,601,000 that the railways paid in taxes, the result is $5,422,194,000, the net amount that the public paid for its railway transportation in 1919. In 1930 there were, of course, no government guarantees. If from the total earning of that year of $5,281,197,000 there is deducted $348,554,000 that the railways paid in taxes, the net amount paid by the public for its railway transportation is found to be $4,932,642,000, or almost $490,000,000 less than in 1919.

Similarly, it may be pointed out, in refutation of the criticism frequently made in some quarters that the freight rates have been largely advanced since the roads have been returned to private control, that the average return per ton mile in 1919, a year in which a large deficit was incurred under government operation, was 0.973 cents, while in 1930 it was 1.063 cents, an advance of only 9.2 per cent, whereas wages increased 20 per cent. Applied to the freight traffic of 1930, this advance in rates cost the shippers in that year approximately $325,000,000, or $100,000,000 less than the increase in average hourly wage rates between 1919 and 1930 cost the railways in 1930. Consequently, if there had been no advance in rates, and no advance in wages, the railways would have earned about $100,000,000 more net operating income in 1930 than they did. Stated in another way, railway employees, through the increase in their average hourly wages, received $100,000,000 more in 1930 than the railways themselves received from the difference between the average freight rates of 1919 and 1930.

So much for the public and the employees. What did the railways get? Less than nothing at all. In 1919 they earned $455,000,000 net operating income and received about $501,000,000 in government guarantees, a total of about $956,000,000. In 1930, after increasing their investment almost $7,000,000,000, they earned only $869,000,000, or $87,000,000 less than 12 year before.

It is this latter fact and the further fact that the rate of return earned on the property investment in 1931 was less than 2 per cent as compared with 3.2 per cent in 1893 (a year when more of our railways were bankrupt than in any other year in history) that has brought the railways so prominently before the public. It is because of the very acuteness of the present situation that the Interstate Commerce Commission authorized a temporary advance in freight rates which went into effect on January 4, and which is expected to add $100,000,000 to the revenues of the roads this year; that Congress has passed the Reconstruction Finance Corporation bill establishing a two billion dollar credit fund to aid the railways and other concerns in refinancing their maturing obligations; and that has led the employees themselves, through their delegated representatives, to agree to a reduction of 10 per cent in their wages for a period of one year.

MORE MONEY

Must Soon Be Spent for Maintenance

THE unique experience of seeing a section gang engaged in spot surfacing in the vicinity of Chicago in the middle of January was a convincing demonstration of the unusual weather conditions that have prevailed throughout most of the country during the present winter. Not only has it been possible to continue productive work with such forces as are available but there has been a singular absence of the expensive but non-productive work that ordinarily accompanies the advent of cold weather. Frost has been encountered, if at all, in such limited amounts as to obviate the need of shimming in territories where this operation is normally a regular feature of winter work. At the same time, railways in northern areas, which are frequently compelled to spend many thousands of dollars during December and January in fighting snow and sleet, have thus far incurred little expense on this account during the present season.

The experience of the last two months serves also to emphasize the remarkably favorable weather conditions that have prevailed throughout the entire period of the depression, which is now in its third year. Throughout all of 1930, deficient rainfall, while giving rise to increased expense for water supply, resulted in an unusual solidity of roadbed that greatly decreased the problem of track maintenance on a large part of the railway mileage. Furthermore, the increase in precipitation during 1931, which relieved the shortage of water supply, was

so uniformly distributed as to effect an almost complete absence of local floods or washout troubles except those which recently took place in the lower Mississippi valley.

In general, therefore, maintenance of way expenditures during the past two years, while far below normal, have been devoted to a smaller extent to the meeting of emergent conditions than has been the case in a long time. Measured in terms of the output of productive work done, every dollar of the limited outlay for track maintenance during 1930 and 1931 went a great deal further than was the case with an equal number of dollars during the years immediately preceding. But this does not mean that maintenance of way operations during the last two years have kept up with the normal wear and tear that has taken place. Rather, it serves to emphasize the fact that the physical condition of the tracks and structures is as good as it is in large measure because of the unusually favorable weather during that time. Not only is there an accumulation of deferred renewals which must be made good sooner or later, but periods of heavy rainfall may at any time produce an abnormally rapid deterioration of the excellent line and surface that have been maintained on most railways.

Thus it is clear that any improvement in the financial conditions of the railways, such as is now looked for shortly, is certain to result in increased appropriations for maintenance of way.

THE REAL COST

Compare the Outlay for Repairs and Renewal

HOW much money can a railway afford to spend for the repair of a bridge to postpone the larger expenditure for its complete renewal? In so far as this question relates to a steel bridge, it must be answered on the basis of facts relating to the individual structure, but in its application to pile and frame trestles there is opportunity fo the study of some general aspects.

Divested of its refinements, the answer to the above question is that it pays to renew a structure whenever the annual expense for repairing it is more than the annual charges on a new structure. Since these annual charges are dependent on the interest rate the railroad must pay for its money, the answer depends on the company's credit, which explains why some railroads will invariably carry over structures at a greater proportionate outlay than is the policy on other properties. It is also the basic reason why all of the roads are now making every effort to carry over more structures than they do in normal times.

On what is the subordinate officer to base his judgment in deciding what his recommendations will be with respect to particular structures? How far does it now pay to go to avoid a complete renewal? In the face of pressure imposed by the management to cut expenditures to the minimum, it is readily possible that he may misjudge the real policy in such matters and recommend repair work that will cost far too much compared with the annual carrying charge for a new structure.

No specific suggestion may be offered, for naturally the answer depends on the financial condition of the individual railway. Of course, where six per cent is normally considered a reasonable limit of the ratio of the cost of repair work to the cost of renewal in normal times, it is obvious that that is not a practical limit today. On the other hand, 25 per cent or even 20 per cent is obviously too high. Perhaps after all, no definite percentage can be arrived at, but by studying each case in terms of the relation of the cost of carrying over to the cost of renewal, a more intelligent conclusion will be reached than would otherwise be possible. Furthermore, a recommendation placed in this light will afford the higher officer a more definite basis for a correct decision.

SAFETY FIRST

Responsibility of Employees and Management Equal

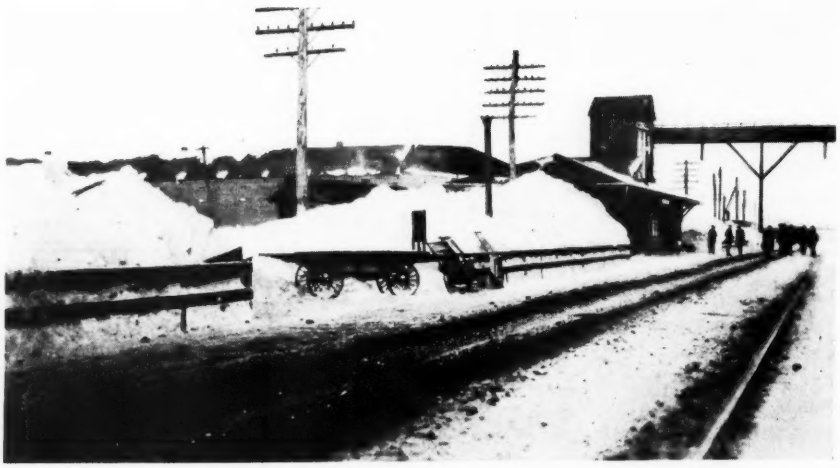
ORGANIZED measures for accident prevention have been carried on by the railways for more than 20 years, and much time and effort have been expended in providing safe working conditions and in educational work along safety lines. During this period the number of accidents, both relatively and absolutely, have been reduced to a gratifying extent. Yet they have not been reduced to the maximum that is possible through full enforcement of those measures that have been applied locally at one point or another.

Only the management of a railway can carry on organized safety work. Only the management can provide in an organized way for safe working conditions, and although its responsibility does not end here, it is at this point that the responsibility of the great body of employees begins. Having been provided with safe working conditions, it becomes the responsibility of the local supervisory officers and employees to maintain them to the required standard.

It is the duty of the track supervisor to know that the tools that are provided are in first-class condition and that they can be used with safety. The section foreman should have the same knowledge, but it is also his duty to maintain them in good condition and to see that they are used in a safe manner. No track tool is being used safely when it is employed for some other purpose than that for which it is designed. No tool is safe that is out of repair or is badly worn. Many tools are not safe in the hands of inexperienced men.

While evidence of willful violations of safety rules is rare, carelessness or indifference on the part of supervisory officers and employees may, and often does, nullify the best efforts of the management in the work of accident prevention. The records of every railway will disclose that practically all personal injuries are unnecessary, and that they can be avoided by the exercise of proper care and thoughtfulness on the part of the victim or his comrades.

Unfortunately, on many railways the number of personal injuries in the maintenance department have not been reduced in the same ratio as in other departments. Yet the same basic principles apply to all departments, and the members of this department, both supervisory officers and men, can do more to better this record than can be done in any other department of a railway.



A Typical Station Scene on the B. & A. During the Winter

Intense Cold and Heavy Snow Make

Winters Severe in Maine

TRAVERSING a section of the country with an annual snowfall from 90 to 130 in. and temperatures as low as 47 deg. below zero, the Bangor & Aroostook faces a yearly struggle with the elements to keep its tracks open and in a safe operating condition. Among other equipment, this road of 614 miles operates 23 snow plows and 4 spreaders together with a number of flangers to keep its tracks open for continuous winter service.

The Bangor & Aroostook lines are located in northern and eastern Maine; they are mostly single track, and extend from Searsport, on the Atlantic seaboard, to the St. John river, which forms the boundry with Canada. For operating purposes the road is divided between the Northern division, including the main line and branches north of Oakfield, and the Southern division, which comprises the main line and branches south of that point.

Cold and Heavy Snows Beset Road

By far the greater part of the mileage of the road lies north of the 45th parallel, and some of it is north of the 47th parallel, where the winters are not only long and extremely cold, but where heavy snowfalls are commonplace. A 10-year survey of the four winter months, December to March, inclusive, shows that on the Southern division the winter temperatures range from 35 deg. above zero to 38 deg. below zero, while on the Northern division the temperatures range from about 32 deg. above zero to as low as 47 deg. below zero. During practically every winter there are as many as 10 days in one month when the temperature does not rise above zero during the entire 24 hours.

The average annual snowfall in the territory served by the Bangor & Aroostook ranges from about 90 in. to 130 in., and, at Houlton, Maine, near the south end of the Northern division, it is 125 in. Average snow storms

Bangor & Aroostook has constant struggle to keep road open and in a safe operating condition

last from six to eight hours and produce falls of from four to eight inches, while heavier storms of from 10 to 24 hours duration produce falls of from 16 to 18 in., and have been known to result in falls of as much as 22 in. Most of the heavier storms come out of the northeast, and, driven by high winds, cause extensive drifting, which is usually more serious than the actual depth of snowfall. The depths of the drifts vary with the physical conditions of the road and the protection afforded either naturally or artificially at different points, but average from a few feet above the depth of normal fall to as much as 10 to 12 ft.

The severity of the snow conditions on the road are revealed in a 10-year survey, which shows that within this period on the Northern division, snow fell an average of 30 days per year and drifted 23 days, while on the Southern division it fell during 48 days annually and drifted 20 days.

Winter Traffic Is Important

The Bangor & Aroostook is not a heavy traffic road but it does operate some important produce trains, principally potato trains, from the famous potato country north of Houlton, in Aroostook county. In this territory, the railroad loaded 43,580 carloads of potatoes in 1929, about one-fifth of the total number of carloads of this product loaded in the entire country. This large crop, which accounts for more than 30 per cent of the total traffic of the railroad, moves principally during the

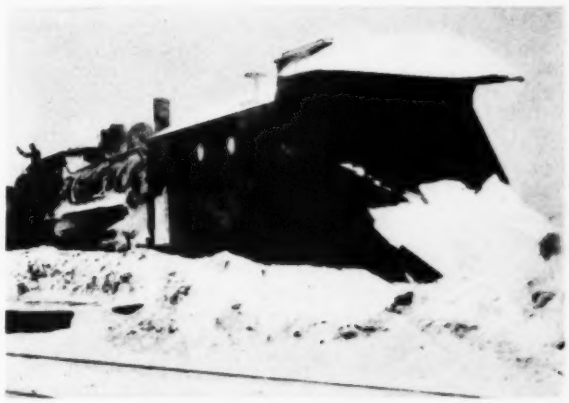
months of October to April, inclusive, which not only complicates matters in itself, but is one of the most important reasons for keeping the railroad open at all times during the winter. Another complication in winter operation on the B. & A. is the fact that the section of heaviest traffic density on the road, which extends between Millinocket and West Seboois, a distance of 14 miles, lies directly within the area of heaviest snowfalls.

As a result of the severe winter conditions, the B. & A. has given considerable study to the problem of fighting snow, a problem which is largely one of drift control and snow removal out on the line. Many miles of permanent snow fences line the right-of-way where drifting is known to be particularly severe, these consisting usually of cedar posts with 3-in. by 5-in. stringers and 1-in. by 6-in. by 8-ft. face boards. Where the snow fences must be set on private property along the right-of-way to be the most effective, temporary fence of different types is used, the latest type to be tried being wired slat fencing, which can be rolled up and stored during the summer months.

Snow Fighting Equipment

The major snow-fighting equipment on the road includes 23 snow plows, 21 flanger cars and 4 spreader cars. The plows are of the single and two-sided types, and four of them are provided with wings which reach out eight feet each side of the center line of the track. Twelve of the plows, including three of the wing plows, are equipped with air-operated flangers, which remove the snow down to the top of the rail for a distance of 16 in. outside of the rails and down to 1½ in. below the top of the rail for a distance of 12 in. inside the rails.

Rerailing a Snow Plow Derailed in Clearing Out and Widening an 18-ft. Snow Cut



Replenishing the Boiler Water Supply of a Double-Header Snow Clean-Up Train

Around Terminals the Deep Snow is a Big Handicap to Efficient Operation

A Permanent Snow Fence Installation on the B. & A., After a Severe Winter

Just as sure as winter follows summer, just so certain is the road that each winter will be a hard one and that it must be fully prepared to meet extreme conditions. Recognizing this, every employee accepts his responsibilities for storm duty in a "matter of fact" manner, and early in the fall attention is turned, almost automatically, to winter preparation so that all snow-fighting equipment and supplies will be in readiness for the first heavy fall, and that forces are organized to meet any conditions which may arise.

By the first of November all snow-fighting equipment on the road is scattered over the system at the most strategic points, with operators and crews definitely assigned and ready for snow-fighting duty on a moment's notice. At this same time, quantities of salt, shovels and brooms are stored where they will be most convenient, black and white wing plow markers on yellow posts are put on both sides of girder bridges, trestles and other obstructions to the plows, and evergreen trees are cut and set alongside all switches and road crossings as flanger signs.

Snow Plows Have Heavy Work

The make-up of the snow-fighting trains on the road varies with the depth of the snow and the general condition of the line. Early in the season, relatively light snows are removed by plows without wings and with or without flangers, but when accumulated snow has been piled high along the tracks, the problem is not only that of removing the new snow that falls directly on

the tracks, but of equal importance, of widening out the snow cuts to provide room for later snows and to minimize the effect of drifting.

With the start of a storm, the plows are put in operation in an attempt to keep abreast of it and not allow the road to become blocked. In many cases, plows are run immediately ahead of important freight and passenger trains to insure their getting through, the plows ordinarily operating from 30 to 35 miles an hour, depending upon the character and depth of the snow.

Drifts cause the main problem, particularly sloping drifts which are much more likely to cause derailment of the plows. In drifts of from 6 to 8 ft., best results are secured at speeds of 20 to 25 miles an hour as the snow that is plowed back at those speeds is more stable than when the plows are operated at higher speeds and, furthermore, not as much snow is thrown up over the plows and back on to the track. However, where drifts are as deep as 10 to 12 ft., it is usually necessary to hit them at speeds of from 35 to 40 miles an hour in order to get through at all, and then to make a second trip over the track to remove the four feet or more of snow which falls back into the cut.

Much Clean-Up Work Necessary

After a storm is over and the road has been opened temporarily for traffic, the major problem is to clean up the railroad, especially widening out deep narrow snow cuts, in preparation for the following storm. This is usually done by heavy clean-up trains, consisting of the following equipment in the order of its arrangement in the trains: A wing plow, which reaches out eight feet on both sides of the track; a Jordan or other type of spreader with a reach of 21 ft. on each side of the track; one or two locomotives; a caboose, and a flanger car if the plow is not equipped with a flanger. In addition, most of the clean-up trains carry a bunk car just ahead of the caboose, providing quarters where the snow-fighting crew can eat, sleep and get warm while not on snow duty. These trains, which sometimes require three or four days to clean up the line completely, move over the road, plowing the snow over the sides of fills, spreading it back in level open stretches, and cleaning it out of natural cuts or deep artificial cuts through drifts in a widening-out process. The result of these clean-ups is to restore normal operating conditions until the next storm, and to make room along the track for the quick removal of the snow which falls in succeeding storms.

The general clean-up in yards is done principally with the same equipment that is used on the main line, just as soon as the main line and more important branch lines have been opened up. In this work, the spreaders push the snow across one track after another until it is all pushed off at the sides of the yard, or, where conditions do not permit this method, the snow is accumulated on certain tracks temporarily put out of service, from which it is loaded into cars on adjacent tracks by men with shovels and by clam-shell buckets.

The extent of the snow plow work on the B. & A. is seen in figures compiled in making the 10-year survey of snow conditions mentioned previously. According to this survey, snow plows and flangers were operated an average of 50 days annually on the Northern division and 54 days annually on the Southern division. During the winter months, there is almost never a day when there is not at least one crew on the road handling snow. In January and February, the two worst snow months, from 10 to 20 per cent of all train crews are usually employed in handling snow-fighting equipment. In February, 1926, a month in which several severe storms occurred, 27.7 per cent of all crews on duty on the road were employed in snow removal service.

Snow removal from switches and interlockings is largely one of hand labor, using shovels and brooms, since in this cold climate heating or melting devices produce ice which is frequently more objectionable and difficult to remove than the snow. In and about yards and interlockings, the section forces, supplemented by extra men taken on, keep the switches open, working day and night during storms when necessary to keep the switches in operating condition. Out on the line, every switch is provided with a broom, in a suitable holder alongside the switch, for use by section men or trainmen when necessary. Salt is used in and around rigid frogs, crossings and guard rails, but is unsuited for use around switches and movable-point frogs during most of the winter because it will not prevent freezing at the extreme low temperatures encountered. The amount of hand work necessary at mechanical interlockings is reduced to a minimum by providing board covers over the interlocking pipe lines.

Even with the greatest of efficiency in coping with snow storms on the B. & A., they are an expensive proposition. Over a period of 10 years, the annual cost of removing snow and ice amounted to $122,000, or slightly more than 10 per cent of the total maintenance of way expenditure of the road, and 2.3 per cent of the total operating costs. Within the period mentioned, the average cost of handling snow and ice in January amounted to 39.5 per cent of the total maintenance of way expense for the month, and 7.9 per cent of total operating expenses. Under particularly severe conditions, this cost has been known to reach $107,500 in a single month, equal to 71.9 per cent of the total maintenance of way cost and 21 per cent of the total operating expenses.

Extreme Cold Causes Heaving Track

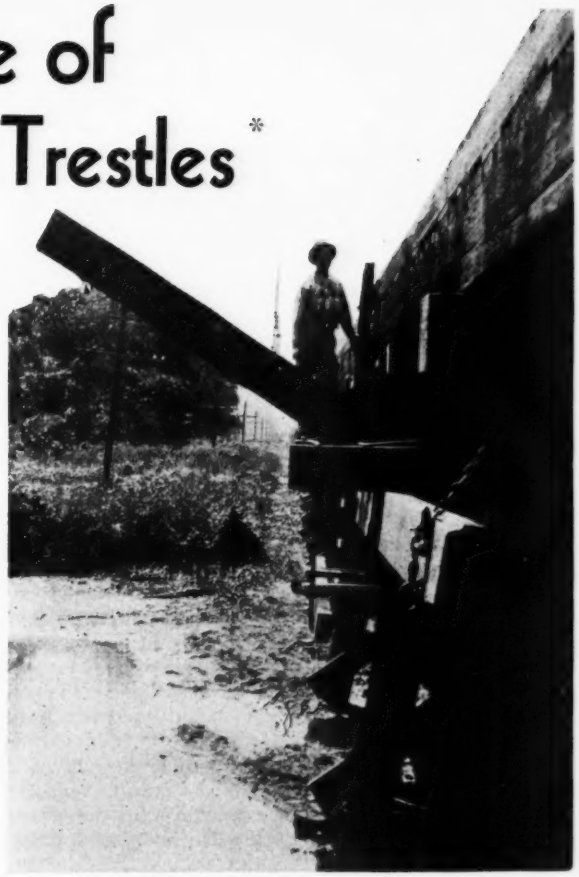
Snow removal is possibly the most important phase of the winter problem on the B. & A., but one almost as serious is that of heaving track and the care of this track in the spring while the ballast and roadbed are thawing out. Owing to the severe winters prevailing over the line, the frost sometimes penetrates as much as five feet into the roadbed, and the track frequently heaves as much as two to three inches. In some exceptional cases, the heaving of track has been known to be as much as eight inches.

With gravel ballast practically continuous over the road, the greatest amount of heaving occurs where the subgrade is of clay, regardless of whether it is wet or dry. The main difference between the heaving in wet and dry clay lies in the fact that the heaving is more uniform in wet territory, and, therefore, involves considerably less work. Where the track rests on a loam subgrade, heaving is considerably less than when on clay. All of the shimming is done with wooden shims from ¼ in. to 3 in. thick, using longer track spikes as the height of shimming may require. Where heaving in excess of six inches takes place, the track is smoothed up by placing ties on top of the ties already in the track, and filling out the raise with shims.

In all track shimmed above one inch, the rails are braced on their outer side, 1½-in. or 2-in. shims being used for this purpose. On curves, the braces are ordinarily provided at every second tie, while in tangent track they are usually provided at every third tie. As a result of the uneven heaving and the uneven settling which take place as the frost goes out, only the most careful attention to the track prevents damage to the rail, while, regardless of the care exercised, the frequent respiking of the ties materially shortens their life.

The Maintenance of Ballast-Deck Trestles*

Report on methods and workmanship designed to effect economies and avoid injury of the treated wood



Swinging a New Cap Under the Deck

THE USE of timber structures of the ballast-deck trestle type fills a niche in railroad construction practice that can be justified by low initial cost, low cost of maintenance and by the semi-permanent character that it derives from the use of creosoted timber members which has become so widespread. The life of structures of this type with untreated timber decks varies from about eight years up, depending upon climatic and other conditions favorable to decay. In arid parts of the country some of these untreated decks have had a life of 22 years. Creosoted decks last from 25 to 40 years.

Depends on Work To Be Performed

The amount of maintenance necessary depends largely upon the type of work performed when the trestle is constructed or renewed. Probably the most important consideration in the life of a trestle, outside of good workmanship, is the exercise of care to avoid puncturing the treatment which preserves the wood. Consequently as little framing or cutting of timber as possible should be done in the field or after treatment. All framing should be done before the timber passes through the treating plant. This may sometimes require measurements in the field so that the proper fit may be obtained.

Where the cutting of timbers or the boring of holes for bolts cannot be avoided, the exposed wood should be treated with an application of hot creosote oil. Likewise the tops of piles (cut-off), should be treated with an application of creosote heated to the boiling point so as to secure maximum penetration. Many railroads go even further than this. The Illinois Central fastens a ring or band of metal to the top of a pile and fills it with hot creosote oil, permitting the oil to stand for some little time so that maximum absorption will be obtained. Just before placing caps on the piles, many roads apply a heavy coat of hot tar or pitch. It is good practice, where the top of the pile has a greater diameter than the width of the cap, to chamfer the end, so that moisture running down the cap will not rest upon the flat exposed top of the pile. Where this is done, creosote oil and hot tar or pitch should be applied. Some roads place roofing paper or second-hand car roofing between the top of the pile and the cap as additional protection against moisture. When this is done, care should be taken that drift bolts do not destroy this protection.

Must Be Inspected Periodically

The periodical inspection of trestles is important, as this inspection determines what repairs the structure needs and when they shall be made. Where a bridge and building foreman and gang cover a given district, inspections should be made monthly by the foreman, who should send reports of needed repairs to the supervising officer. Supervisors should make inspections at least every three months, from one of which the annual budget of major repairs and renewals can be prepared. Where division bridge and building inspectors are employed, quarterly inspections should form the basis for reports from which the repair work can be laid out. A system inspector should make an annual inspection to determine the condition of structures and secure information for the following year's budget. If a trestle has untreated piles or if the age of the creosoted piles is such that some decay is taking place, a thorough inspection should be made each year, with the assistance of several men to dig around the piles, so that their condition immediately below the ground line can be determined. This inspection should be made every three or four years if piles are creosoted. Frequently, boring into a piece of timber or a pile will determine its physical condition, but care should be taken to plug the hole.

*This comprises an advance printing in abstract of a report prepared by a committee of the The American Railway Bridge and Building Association for presentation at the convention which was to have been held in October, 1931. Because this convention was postponed until October, 1932, the association has authorized the publication of this report in *Railway Engineering and Maintenance*.

The personnel of the committee is: H. I. Benjamin, chairman (S. P. Co.), T. H. Strate, vice-chairman (C. M. St. P. & P.), C. W. Boyce (I. C.), L. G. Byrd (M. P.), J. L. Duncan (M-K-T), W. C. Harman (S. P. Co.), W. V. Parker (S. L. S. W.), Arthur Sweet (Santa Fe), B. M. Whitehouse (C. & N. W.), G. W. Young (B. & O.).

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Ordinarily no two pieces of timber will show the same signs of failure due to decay or other causes in the same period of time. For this reason there is no economy in replacing a failed member with one that would have a considerably longer life than the balance of the structure. The decision as to whether treated or untreated timbers are to be used should be made by the supervisor or the division engineer.

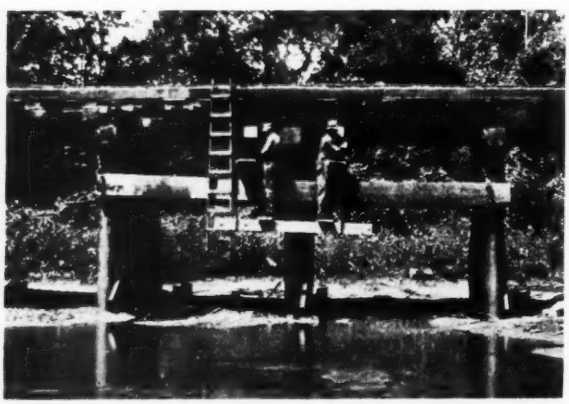
In repairing structures of the trestle type, two groups may be considered:

1. Those structures over waterways, which, except during storms or exceptional periods of rainfall, are dry and where the ground line is 15 ft. or less below the bottom of the deck.
2. Those which are high or are continuously over water.

The first group calls for comparatively simple methods of renewals, as in most cases the work may be carried on from the ground. The second group calls for staging and, in most cases, a larger gang of men, as work must be carried on from the deck of the structure.

Replacing Individual Piles

Many railroads will not permit more than two piles of a five or six-pile bent to be spliced, except on branch lines of light traffic where most trestles are, however, of the open deck type. They also require that each pile shall have a minimum diameter of eight inches of good sound timber. Where more than two piles in a bent are replaced or where the sound timber in the piles is below the standard set, the entire bent should be redriven or replaced with a frame bent. Redriving calls for tearing up the deck and should be avoided except when the deck is to be renewed. Where an entire bent is to be replaced it has frequently been found economical to drive two additional outside piles, one on each side, and replace the remaining portion of the bent with a framed bent, tying the piles and framed timbers together with lateral



Staging for the Replacement of a Cap

bracing. These two outside piles may usually be driven without the necessity of tearing up the deck and they lend additional transverse stability to the structure.

If a pile should decay or fail within 10 or 12 in. of the bottom of the cap, it should be cut off for a distance of 12 or 14 in. from the top, and the upper portion replaced with a header block or sub-cap. If more than two piles fail in this manner and the others in the bent are in good condition, the bent should be double-capped.

The points of worst decay in piles may be concealed by loose dirt, water or snow. Consequently in replacing an individual pile, sufficient excavation should be made to expose sound timber in the old pile, and the new cut should be liberally saturated with creosote oil. The pile may then be spliced by using another pile or a square stick. Butt splices are generally made, using splicing plank that are spiked or bolted on the sides. In making such a renewal, the cap is first jacked up to take the weight off of the old pile, after which the drift bolts are cut. The jacking presents no difficulties where waterways are dry and the headroom from the ground is moderate, but where the distance is greater than 15 ft. or where there is considerable water under the structure other methods of jacking must be used. These will be described later.

Replacing Entire Bents

If an entire bent is to be renewed, the piles in the old bent should first be exposed by excavation to a depth where the piling is sound. The distance below the cap should then be measured so that timbers may be framed to the correct length. After the deck or cap has been adequately supported, using false bents on each side if the traffic is heavy, the piling is cut off level, hot creosote oil being applied on the timber exposed, after which a creosoted sill is drift-bolted to the piles and the rest of the frame bent is set in.

If the bent is to be redriven, it is necessary to tear up the deck planking and to move one or two of the stringers, so that a pile may be let down through the deck. If the deck is 12 ft. or more from the ground, the pile may be driven alongside the cap and pulled under after being cut off. This will do away with the necessity of removing the cap.

Where caps need replacement, the method to be used depends upon the length of time that the structure may be taken out of service. Where the time between trains is 2½ hours or more, the deck may be raised by means of jacks and shores. This may be done by placing 6-in. by 12-in. or 12-in. by 12-in. blocking on the ground to serve as bases for jacks with which to raise the deck, by means of 6-in. by 8-in. shores and a header under the stringers. This method is applicable for low structures. After the deck has been raised, the drift bolts are cut with a cutting torch, a hacksaw or cutting bars. The cutting torch is the quickest, but is not always available and, if used, care should be taken to avoid a possible fire. If a hacksaw is used, and this is probably the commonest device, the blades should be about 22 in. in length, with a special long frame for this purpose. The cutting bar is not so satisfactory, being more hazardous since one man must hold the bar while another strikes it. In this case, a heavy bar with a cutting edge (similar to a lining bar) is held against the bolt on one side while a short light cutting bar and a hammer are used to cut the bolt from the other side.

After the drift bolt has been cut, the old cap may be rolled off of the bent and the new cap set in its place by means of skidways or with block and tackle. The deck is then lowered. If possible, the application of hot creosote oil must not be overlooked. The oil should be applied before the cap is set on the bent. A good active crew can renew a cap in this manner in about two hours. Where trains are too frequent to permit of this method, it is sometimes advisable to place temporary bents on each side to carry the live load. These methods may also be used for repairing piles.

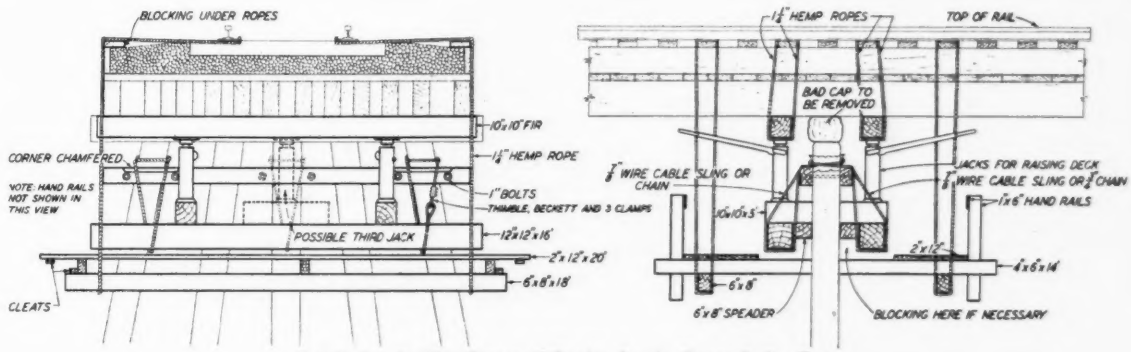
Removing Old Cap in Sections

Another method is to saw the old cap into a number of sections and then, starting at one end of the bent, jack up the stringers over the first section of the cut cap. The next step is to split out the first section of the

cap by means of wedges, cut the drift bolts and immediately start to slip in the new cap from the end. This operation is repeated until the new cap is in place. This keeps the structure safe for traffic, except for very short intervals of time. It is important that the deck should be raised only enough to take the load off of the cap and permit the new one to be slipped in.

Drift bolts should be replaced either by removing a portion of the deck and driving from the top, or by boring through the planks without taking them off. Probably the most satisfactory method is by boring diagonally upward through the side of the pile and through the cap and driving from the bottom.

Where the deck is more than 15 ft. above the ground or over water, staging is necessary. The type of staging depends upon the material available, but every gang



Details for the Sling-Supported Staging for the Renewal of a Cap

should have sufficient rope, timber and cable in its outfit for this purpose. This matter should receive the personal attention of the bridge and building foreman to see that all material is in the best of condition and that the staging is safe before the men start work.

One Form of Staging

One method of constructing staging is as follows: Two 6-in. by 8-in. by 18-ft. (for single track structures) needle beams are suspended from the deck, one on each side of the bent, by 1¼-in. manila ropes. These should be placed just far enough under the deck to permit men to work on them easily. The ropes may either pass under the rail and over the track tie or around the outside guard timber. Metal hooks may sometimes be used to hold the ropes, and some railroads fasten the ropes to the hand railing if the latter is sufficiently strong. Whatever type of fastening is used, care must be taken to protect the rope from chafing. Three ledgers 4 in. by 6 in. by 14 ft. are placed through the bent and supported on the needle beams. Two or three 2-in. by 12-in. by 20-ft. planks are placed on the ledgers parallel to the bent and serve as a floor. Cleats should be nailed to the bottom of the planks so that they will not slip off of the ledgers. To keep this staging from swinging, it may be braced to the piles with 1-in. by 6-in. boards. Hand railings should be used as a safety measure. One good design consists of ⅞-in. round iron bars, about 30-in. high, upset to ¾ in. at the lower ends and set into holes in the ledger pieces. The other ends of the bars are tapered to ⅜ in. and curled over to make an eye through which a 1-in. line may be strung to serve as a railing. If desired, either single or double staging may be used, that is, staging planks and hand rails on one or both sides of the bent.

Many bridge foremen prefer to use staging with needle beams parallel to the length of the trestle, as described under stringer replacement. These needle beams should rest against the outside or batter piles and the planking should be placed directly on them, parallel to the bent.

Jacking Up the Deck

After the staging has been swung, the top jacking caps should be lowered from the deck, swung under the stringers with hand lines, drawn up tight to the deck and lashed with 1-in. or 1½-in. manila ropes in the same manner as is done with the staging. Two 6-in. by 8-in. furring pieces, one on each side of the bent, are bolted to the piles at a point about 6 in. down from the tops of the piles. Next, ⅞-in. wire rope slings, made up of pieces about 17 ft. long, with three clamps, are put around the pile above the furring pieces using one full wrap for each sling. Some sort of lagging should be used between the wire rope and the pile to prevent the rope from cutting into the pile. Caboose chains are sometimes used instead of wire ropes and, except that special wire rope is ordered, would probably be used more commonly.

When the slings are ready, the lower jacking sills are swung under the deck and placed in the slings. Across these two pieces, two 10-in. by 10-in. by 5-ft. blocks are placed to serve as support for the jacks, using spreader bars of 6-in. by 8-in. timbers, or similar pieces to keep the sills apart. Four jacks are then set and the deck is jacked up. The old cap should be sawed into at least two sections before the jacking timbers are placed. When jacking up the deck, the cap may lift with the deck, in which case it should be tied down with a chain to the 10-in. by 10-in. jack block, so that the drift bolts will be exposed between the cap and the stringers. Then block up between the stringers and the cap and release the jacks on one side, lowering the top jacking timber and cutting the drift bolts from that side. The cap itself can be lifted free of the piles later with a smaller jack to cut the cap bolts. After all bolts are cut, the pieces of the cap are shoved out and pulled onto the deck.

Handling the Timbers

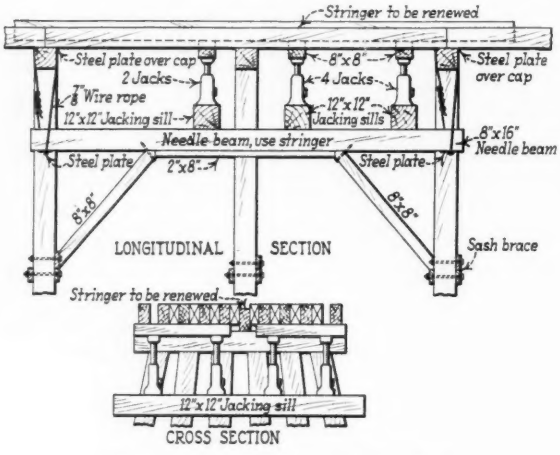
If small derrick cars are not available, the timbers can be handled with a jib pole (one end of which is placed under the rail and the other pointed out over the edge of the deck), to which is attached a set of 6-in. blocks with a 1¼-in. hemp line. The cap may be hung from these blocks a sufficient distance off center so that a large portion of it can be swung under the deck and be placed on the piles by the men on the staging. After

this, it is pulled under by the men on top of the deck with hand lines, assisted by the men below who shove it endwise into position. Drift bolts are replaced as previously described.

Another method of jacking is to bolt and clamp a 6-in. by 12-in. piece or a stringer on each side of the bent, from which jacking may be done. Longitudinal or transverse girts are also utilized quite frequently as supports for the jacks.

Renewing the Stringers

When individual stringers have failed and require replacement, every effort should be made to place an additional or helper stringer alongside so as to obviate the necessity of jacking or tearing up the deck. When new decks are put on, the stringers should be spaced with this in view. In other words, if standards permit, the stringers should be spaced 7 in. to 8 in. apart so as to allow 6-in. or 7-in. helper stringers to be inserted.



One Form of Staging for the Renewal of Individual Stringers

Helper stringers can be set from underneath the deck, using staging where men cannot work on the ground. The top edge of the stringer at the end to be first inserted between the cap and the floor planking should be beveled or rounded so as to fit in at an angle. The stringer should have a minimum length sufficient to reach at least from center to center of caps.

Where a number of stringers need replacement, it will be necessary either to jack up the deck a sufficient height to clear the stringers to be replaced or to tear up the deck. In tearing up the deck, one good method is to strip the ballast from 1½ panels of the deck, blocking the track ties on the exposed floor to carry traffic, and then remove the floor and replace the stringers in the panel that has been stripped. The floor is then replaced and the ballast stripped from the panel ahead is used to fill the panel just repaired. Only the final panel will require new ballast. This method should be followed only if the existing ballast is in good condition, as otherwise it will prove more economical to waste the old ballast and secure clean new material. The only objection to this method is that if the entire deck is not to be renewed, some of the good material may be ruined in tearing it up. Gangs should exercise extreme care that good material is not destroyed, so that it can be preserved for further use.

Where the entire deck of a structure is to be renewed and a spur set-out track is available close to the work, a locomotive crane should be used. On structures that are in double-track territory all traffic should be routed over one track if possible so that work may proceed without interruption.

The Tools Required

No special tools are needed for repairs to ballast deck trestles, other than those which can be used to advantage in handling other classes of bridge work. These consist primarily of the following:

1—gang motor car
1—push car, heavy duty
1—hand winch or crab
4 to 6—25-ton jacks
2—12-ton jacks
2—No. 2 track jacks
4—claw bars
2—chisel bars
4—cant hooks
4—peavies
2—tamping bars
2—clay picks
2—claw hammers
2—No. 5 double-bit axes
4—foot adzes
1—framing square, 18-in. tongue.
2—hack saw handles, to fit blades
24—hack saw blades, 22-in.
2—hand saws, 7-point
2—10-lb. mauls, double faced
6 to 8—caboose chains (or ⅞-in. wire rope)
4—lug hooks
4—timber bars
2—wooden commanders
4—ratchet wrenches
2—24-in. S-wrenches
4 to 8—50-ft. pcs. 1-1¼ in. manila rope
3—30-in. plumb and adjustable levels
1—track level
2—spike mauls
4—lance-tooth, cross-cut saws
6—1⅜-in. augers, long shanks
6—long-handled shovels
4—6-in. blocks
2—12-ft. ladders
Necessary lumber, etc., for staging, blocking and setting jacks.

The general consensus is that a ten-man gang (including foreman and flagmen) is sufficient to carry out work of this character. No consistent labor cost figures are available, as the number of pieces of timber to be renewed on a structure and the frequency of trains enter largely into any cost figures. One railroad reports that 12 to 14 man-hours are required for a stringer renewal and 20 to 25 man-hours for each cap renewal, but these figures appear to be low. The Missouri Pacific recently made a cap renewal on which careful time and cost records were taken. The renewal was made between 7 a. m. and 3 p. m., during which time there were approximately ten train movements. The cost figures were as follows:

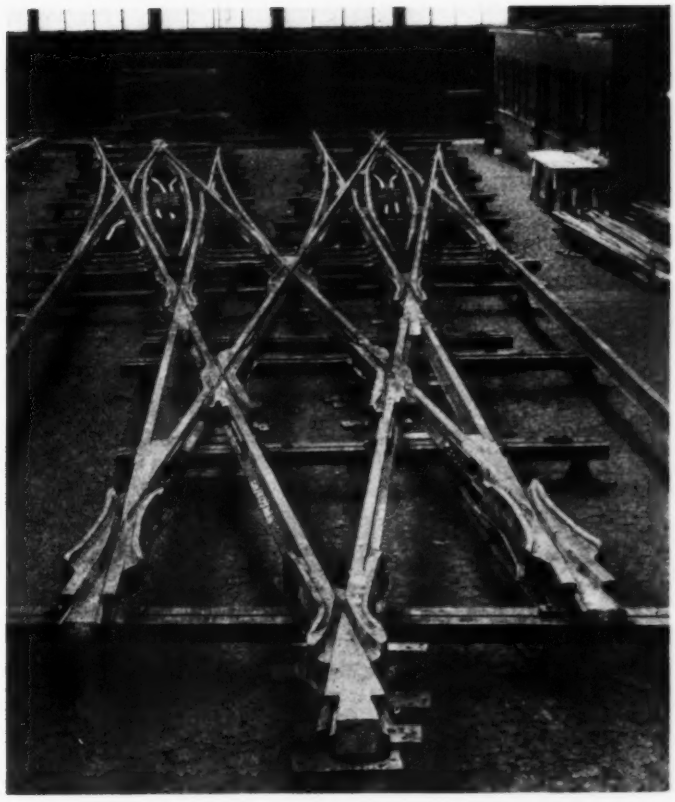
	Man-Hours	Cost
Trucking new cap and scaffold material 2 miles to the bridge	8	$ 5.60
Swinging and attaching scaffolding	10	7.00
Removing nuts and bolts	6	4.20
Raising bridge, removing and replacing cap	6	4.20
Replacing nuts and bolts	4	2.80
Removing scaffolding and trucking material back to outfit, 2 miles	12	8.40
Totals	46	$32.20

The man-hour rate on this work was 70 cents.

In conclusion, the committee desires to stress the matter of safety in carrying out this work. The timbers used are heavy and the staging must be safe to carry not only the men working on it, but also the heavy timbers. The foreman should see personally that all timbers used in the staging are in good shape and should test and inspect them periodically. No staging should be suspended by a manila rope of less than 1¼ in. diameter or its equivalent, and it should be so secured as to prevent it from slipping or chafing. Jacks should be tied in such a manner that they cannot "kick out." Hand railings should always be installed. Platforms should not be less than 30 in. wide and all fastenings must be securely made. Cleats should be used to prevent any timbers from slipping off their supports.

Track Layout Made to Measure

Complete system of trackwork units was laid out as a whole and assembled in frog shop before shipment to insure fit



Two Double-Slip Switches and a Double Crossover Test-Assembled on the Floor of the Frog Shop Ready for Shipment

THE Boston & Maine has recently completed a layout of special trackwork that is most interesting and unusual, not particularly because of its extent or complexity, but rather because of the manner of its design and the character of the steel used. The layout referred to was developed in connection with the complete reconstruction of this road's passenger terminal at Boston, and although it was confined to an area only about 3,000 ft. long by 450 ft. wide, it involved the laying of 43,970 lin. ft. of new tracks, and the installation of 18 No. 8 double-slip switches, 74 Nos. 8 and 10 turnouts, 1 special No. 12 turnout, 3 No. 10 double crossovers, and 9 crossing frogs for a single-track crossing of 9 tracks. The significant features of this layout, which is indicated by the heavy lines in the accompanying track plan, are that it consists entirely of medium manganese and heat-treated rail, and solid manganese or heat-treated units of special trackwork, and that all of the trackwork was designed and fabricated in detail by the steel company furnishing the material and was shipped to the road in units, as required, after shop assembly to insure its accuracy.

Part of Larger Project

The layout described, which is of 130-lb. material throughout, and which includes all main line tracks, leads and connections within the immediate passenger terminal area, is a part of a much larger rearrangement of tracks at the terminal. The additional trackwork, however, included principally the construction of a new coach yard and changes at the entrances to two other coach yards, and fell outside the area of the more complicated trackwork designed and fabricated by the steel company.

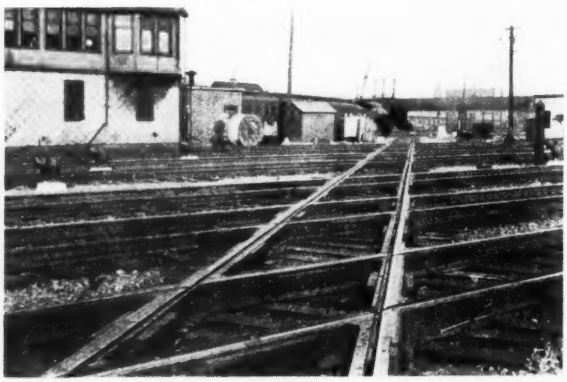
The track changes at the terminal were designed primarily to increase the length of station platform tracks and to co-ordinate and increase the flexibility of operation over the eight main-line tracks of the four divisions which enter the terminal, as well as to simplify movements to and from the enginehouse and the four passenger coach yards at the terminal.

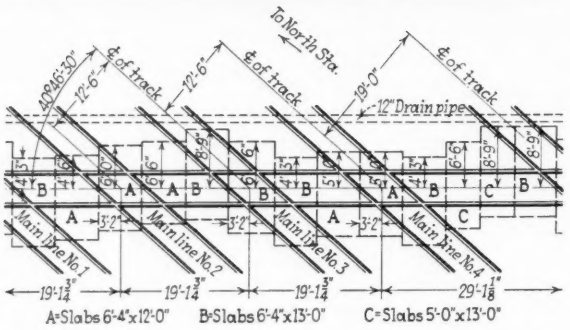
Details of Track Construction

In the heavier construction, all switch material, in both simple turnout and double-slip switches, and all rail through switches or in curves, was heat-treated, cut to length, and drilled and curved in the frog shop. On the other hand, medium manganese steel rails, which the road has been ordering almost exclusively during the last few years, were used in all straight tracks and were cut and drilled in the field. All turnout frogs in the layout are of the solid manganese, self-guarded type. The new track layout is laid on new creosoted crossties and switch timbers. Except on bridges and trestlework, and nine new diamond crossings, where crushed stone ballast was used, all of the new trackwork is ballasted with gravel.

The nine diamond crossings are located at the extreme north end of the layout where a single track to the Hoosac dock properties of the road crosses two enginehouse leads, the six main line tracks of the New Hampshire and the Portland, Eastern and Western route divisions, and a yard lead, at an angle of 40 deg. 46½ min. Three of the crossings are of the bolted type, fabricated throughout from heat-treated steel, while the other six are of solid manganese construction. In this layout, one of the crossings of the two main line tracks of each division is of the heat-treated type, while the other is solid manganese, this arrangement having been provided in order to afford a direct comparison of the manner in which the two types hold up under the same traffic.

In order to afford a good foundation for the crossings, and one which would have the quality of uniformity, and thereby enhance the value of a comparison between the two different types as regards wear and batter, an entirely new foundation was provided. This foundation, in accordance with A. R. E. A. recommendations for reinforced concrete foundations, consists of a series of 15-in. reinforced slabs laid side by side and supported on four inches of cinders. The trackwork above the slabs is carried on a layout of long treated ties placed diagonal to the crossing tracks and supported on 10 in. of crushed stone. The entire set of crossings is subdrained by a line of 12-in. corrugated and perforated iron pipe, placed in stone below and immediately along the south side of the concrete slabs, and sloped to a sewer on the east side of the main body of tracks.





The Top View Was Taken Along the Line of the Nine New Heat-Treated and Solid Manganese Diamond Crossings, While the Drawing Illustrates the Arrangement of the Foundation Slabs Under the Crossings

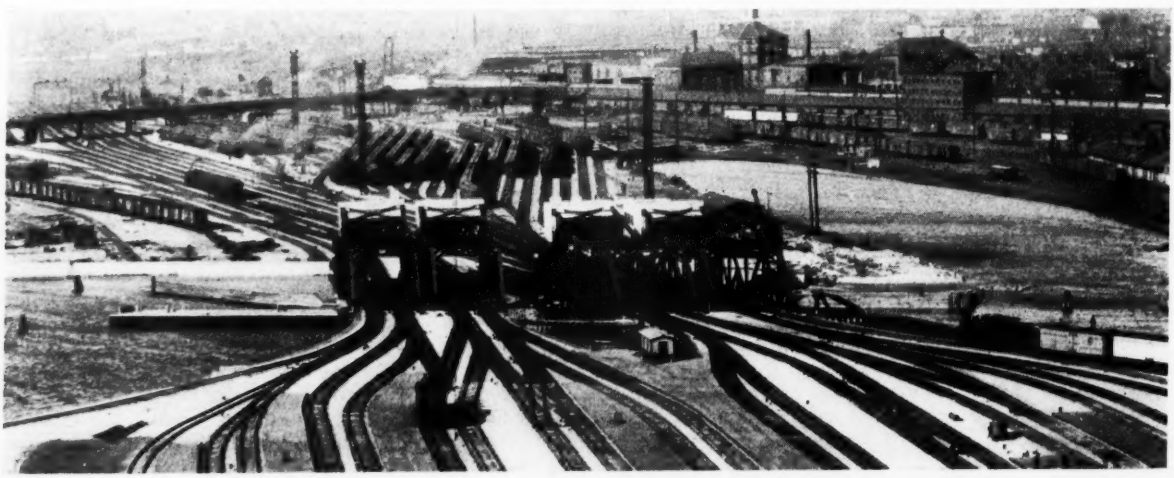
All of the trackwork designated by the heavy lines in the accompanying plan was designed and furnished by the Bethlehem Steel Company in accordance with a base-line plan supplied by the railroad, that showed the track arrangement desired on a scale of 1 in. to 50 ft. From this plan the steel company prepared detailed plans of the layout and of each individual unit of special trackwork, and then fabricated and assembled the different units in its shops to insure their accuracy of assembly in the field. Copies of the detailed assembly plans, which were made to a scale of $\frac{3}{16}$ in. to the foot, and with every unit of trackwork and separate piece numbered, were furnished to the railroad. Then, as called for by the railroad, the specific units of trackwork, with each piece of steel marked with yellow paint in accordance with the plans, were shipped together, separate cars being used for the various slips and turnouts.

In installing the different units, the final locations were staked out in accordance with information on the plans furnished by the steel company, and then checked against the base lines which had been established previously through the terminal. The ground at each location was then graded to within about two inches below the bottoms of the switch timbers, the timbers were held out in their correct positions, and the various parts of the turnouts or slips were then loaded on the timbers and connected up.

Advantages of This System

Through the expedient adopted by the Boston & Maine in handling the trackwork design, the engineering force of the road was relieved of the large amount of highly technical work necessary in designing the track layout; time and expense were saved by delegating the work to those specially trained and qualified to handle it; and the railroad was guaranteed the high degree of precision which was essential in order that the track laying should progress smoothly and rapidly, with no interruptions to traffic and without disturbing or delaying the other closely scheduled phases of the terminal project. Through the co-operation which existed between the railroad and the steel company, all deliveries were made on time, and throughout the entire layout the trackwork matched up accurately, thus avoiding traffic delays of any character due to this factor. As a matter of fact, it was not necessary to make a single cut in any of the rail furnished by the steel company.

The importance of accuracy in the track design, and also of deliveries, is appreciated more when it is realized



Looking From North Station Over the Area of Extensive Track Changes at the Boston Terminal

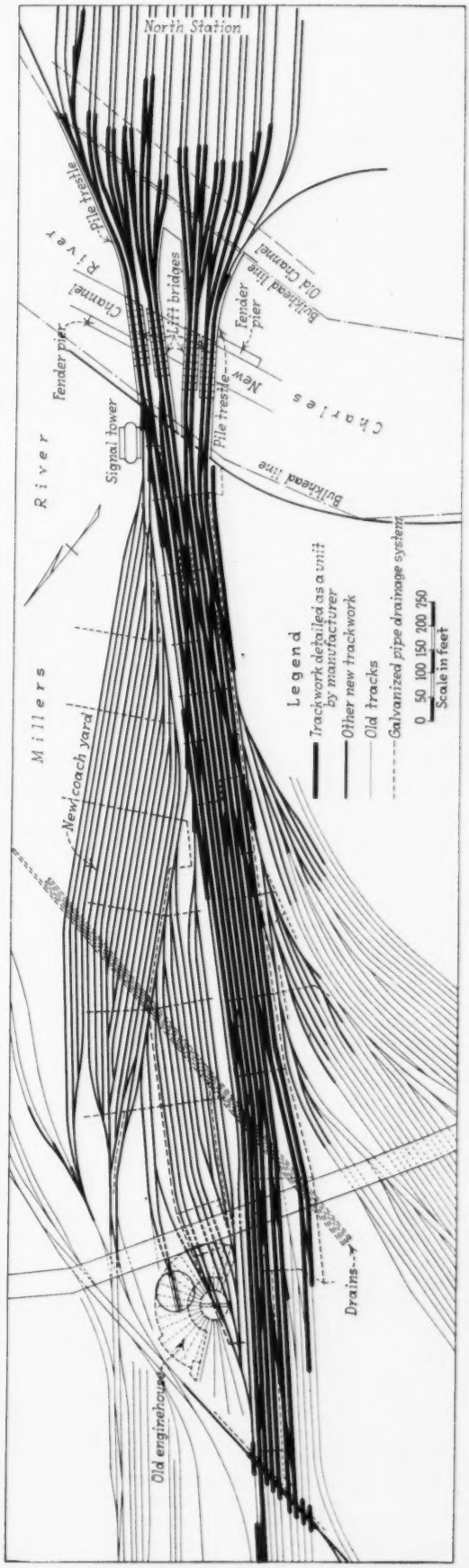
Over 1½ Miles of Corrugated Iron Pipe Were Installed in a Track Drainage System

that the new track layout was superimposed on an old congested layout which was carrying approximately 1,500 scheduled and unscheduled train and engine movements every 24 hours. In carrying out the work, large forces of men, ranging from 100 to as many as 350 at times, were employed, and were frequently called upon to work nights in order to keep abreast of the strenuous program set up. These forces were supplemented by all of the various types of track-laying equipment available on the road, including cranes, ballast cars, power ballasters, power jacks and track shifters, and numerous pneumatic tie tamping outfits. All of the new track materials were unloaded directly on or close to the points of installation, and in practically all cases cranes were used to set the rails in position. In order to speed up the work, some of the new double-slip switches were rolled or lifted into place as units were available room near the points of installation made it possible to assemble them in advance.

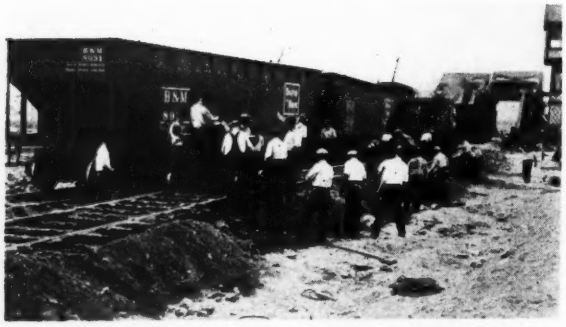
Extensive Track Drainage System Installed

In order to afford complete and ready drainage of the wide expanse of tracks at the terminal, and especially in the vicinity of the special trackwork where poor drainage conditions would cause increased track maintenance and difficulties from freezing in the winter, an extensive system of subdrainage was provided, which involved the laying of more than 1½ miles of pipe lines and the installation of 19 manholes and 185 catch basins. The main problem in connection with the drainage system was the fact that it was installed in an area recently filled in, where the fill, which was made up of a wide variety of materials, had not become thoroughly compacted. Anticipating some slight further settlement of the fill, Armco corrugated culvert pipe was selected for the drainage system, one of the main considerations being its flexibility, which would permit the drainage lines to adjust themselves with any settlement, without damage to the pipe or the drainage system.

In the system, which was installed by the open trench method and largely by hand labor, 7,030 lin. ft. of 12-in. No. 16 gage galvanized pipe was laid in laterals and 1,360 lin. ft. of 18-in. No. 16 gage galvanized pipe was laid in main collecting and discharge lines, the individual lengths of pipe being connected by Armco corrugated



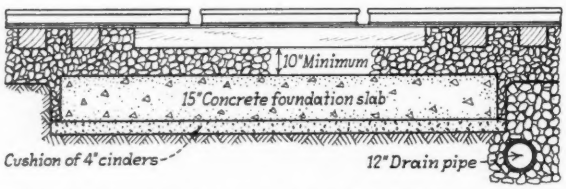
Plan Showing the New Track Layout at the Terminal, with the 130-lb., Specially Designed Trackwork Indicated by the Heavier Lines



Power Jacks and Ballasters Were Used to Speed the New Track Construction

connecting bands. Throughout the system, a pitch of 3 in. in 100 ft. was provided, and a minimum cover of 15 in. was placed over the pipe, below the bottoms of the track ties.

All laterals were provided with catch basins between tracks and at points requiring special drainage, and the collecting lines were provided with manholes at suitable intervals. The catch basins were constructed of two,



Cross Section Through the Foundation Provided Under the New Diamond Crossings

three-foot lengths of Massey concrete culvert pipe, two feet in diameter, while the manholes were of brick and eight feet deep.

The new track and drainage layouts described were planned under the direction of W. J. Backes, chief engineer of the Boston & Maine, and W. F. Cummings, assistant chief engineer, and the installation work was carried out under the direction of H. F. Fifield, engineer maintenance of way, and T. G. Sughrue, division engineer.

Motor Car Operators Sign Safety Pledge Card

IN LINE with its policy of keeping the safety question before its maintenance of way forces by unusual and interesting methods, the Eastern division of the Chicago & North Western has introduced another innovation applying particularly to the safe operation of track motor cars. This idea embodies a rectangular pledge card containing 12 rules for the safe operation of motor cars and a small round card attached to a short cord, which bears an inscription indicating that the wearer is a member of the Safety League of the Eastern division and has signed the pledge card. The pledge card is 3½ in. wide and about 6½ in. long, while the membership tag is 1½ in. in diameter.

The rules appearing on the pledge card were selected from a list of about 1,200 submitted to the division engineer by foremen and others responsible for the safe operation of motor cars. The signer of the pledge card agrees, in the operation of a motor car, to conform to the 12 rules which are as follows:

1. To inspect the car before starting.
2. To keep the brakes in good condition.
3. To get a line-up on trains when practicable
4. To see that all material and tools are so placed that they will not fall off.
5. To allow no one to get on the car from the sides or front, move around, or get off the car while in motion.
6. To see that all persons riding on the car are sitting in the proper position.
7. To main a lookout in both directions.
8. To keep a constant lookout for objects on the rails, and dogs, chickens, etc., on the track.
9. To drive at safe speeds not exceeding those specified in the book of rules.
10. To regulate the speed when approaching a grade highway crossing so as to stop if necessary.
11. To assign each man to his particular duty in removing the car from the track in an emergency.
12. To take no risks and to adopt the safe course.

The pledge cards remain in the possession of those signing them and the membership tags may be attached to the safety rail of the motor car.

We are indebted for the information appearing in this article to C. F. Womeldorf, division engineer of the Eastern division of the North Western.

Getting More Life From Snow Brooms

THE Illinois Central has found that by dipping its snow brooms in hot oil, preferably crude oil, they are given added life through increased flexibility and resistance to decay. In addition, the soaking of the fibers with oil is found to prevent the entrance of a certain amount of moisture, with the result that during freezing weather the fibers do not become as brittle as they would if untreated. The manner of treating the brooms

Dipping Snow Brooms in Hot Oil

is to assemble them together into bundles containing 12 brooms each in such a manner that the working or fiber ends are at the same end of the bundle. The fibers are then dipped into a drum containing the hot oil. It is said that this process increases the life of the brooms from two to three times.

NEW LINES FOR HONDURAS—The government of Honduras is contemplating the construction of 200 miles of line to supplement the present 70-mile system of the National of Honduras, which reaches from Puerto Cortes, on the Gulf of Honduras, to Potrerillos. The contemplated line will extend from the latter point through Comayagua to Amapala on the Gulf of Fonseca on the Pacific Coast.

All-Steel House Protects Banana Shipments

THAT buildings of all-steel construction are meeting with increasing favor for a wide variety of railway purposes is evidenced by the fact that the Chicago, Burlington & Quincy has recently completed a warehouse of this type at Minneapolis, Minn., to facilitate the handling of its important banana traffic into and through that city. Although the building is essentially of special design to meet the exacting service and temperature requirements for bananas, the wall and roof sheathing and most of the windows were supplied as standard units such as are used in the construction of standard steel buildings.

The Burlington has been handling an increasing banana traffic into and through Minneapolis which has recently amounted to as much as 350 carloads a month and it became necessary to provide adequate facilities which will allow deliveries and inspection-in-transit to be made under proper temperature conditions, regardless of seasonal temperature changes. An investigation of the several types of construction that are suitable for this purpose and a comparison of costs led to the decision to erect a steel frame building and to use corrugated steel sheets for the siding and roofing.

Interior View—Note the Ample Clearance

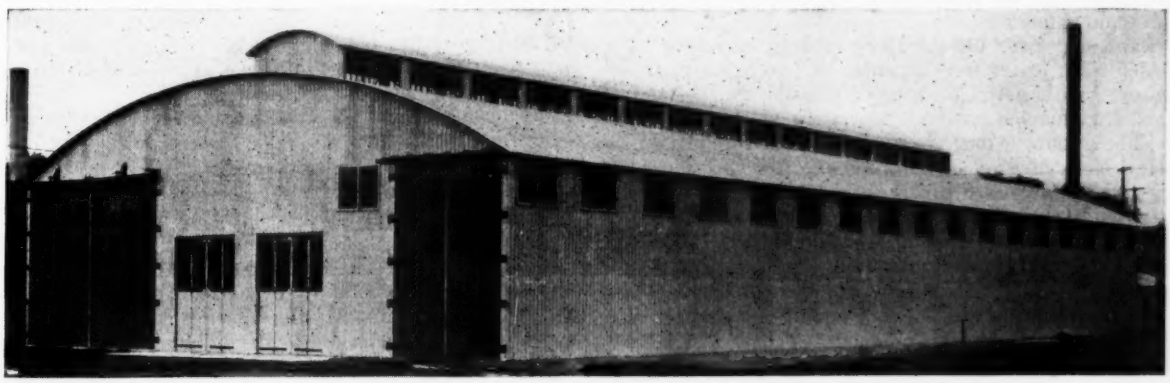
The Design Is Unusual

In design, this warehouse is also a departure from established practice in buildings for this use, which are generally constructed with ceilings as low as clearance requirements will permit. The structure in question has a clear span of 90 ft., and is 200 ft. long. The roof trusses are of the bowstring type and all connections are electrically welded. They provide a clear height of 22 ft. above the top of the rail, while the total height to the top of the monitor is 42 ft. The monitor, which provides both lighting and ventilation, extends nearly the full length of the building, and its sides are constructed of glass in steel sash. The corrugated sheets which form the roofing and the remainder of the siding were applied as standard units directly to the steel frame by means of bolts.

The roof trusses are spaced on 12-ft. centers, and since there are no interior columns, longitudinal stability is obtained by diagonal bracing between the columns which support the roof trusses, this bracing being installed in the end panels and two intermediate panels of each side wall. Heavy knee braces between the columns and the trusses insure transverse stiffness. To provide as much light as practicable above the cars, windows were introduced to occupy most of the space under the eaves.

An Even Temperature Is Assured

To insure the maintenance of an even temperature within the building under the extremes of winter and summer conditions, the walls, ceiling and monitor are insulated with a ½-in. lining of Nuwood. The heating plant consists of two vertical, low-pressure, cast-iron steam boilers which are housed in a separate building of similar construction. The boilers are oil-fired, and are served by an underground fuel-oil storage tank of 11,000 gal. capacity.



The Burlington's New All-Steel Banana Warehouse

Four high-velocity unit heaters, each of which is operated by a 2-hp. motor, were suspended from the lower chords of the roof trusses. The boilers, each of which has a capacity for 6,000 sq. ft. of radiation, furnish steam at a pressure of 5 lb., and the heater fans are operated at 900 r.p.m. Each heater unit has a capacity of 536,000 B.t.u. per hr. and is capable of heating from 60 deg. F. to 128½ deg. and discharging 8,000 cu. ft. of air a minute. When in full operation, these heaters are able to maintain a temperature of 55 deg. inside of the warehouse when the temperature outside is 20 deg. below zero.

Three tracks enter the building at one end. Two lie along one side and the third is adjacent to the opposite wall, the centers being spaced 13 ft. and 60 ft., respec-

tively. A concrete driveway occupies the central space and is of ample width to accommodate all trucking operations. Double swinging doors, with a clear height of 21 ft. and a width of 16 ft. for the single track and of 29 ft. for the double track, protect the openings for the entrance of the tracks. Two similar doors, 12 ft. wide and 14 ft. high at each end, permit trucks to pass entirely through the building in either direction.

All of the concrete required for the foundations and driveway was purchased ready mixed. The reasons for doing this and the method of handling and placing were described on page 726 of the August, 1931, issue.

The building was fabricated and erected by the Butler Manufacturing Company, Kansas City, Mo., under the supervision of H. G. Dalton, engineer of buildings, Chicago, Burlington & Quincy, to whom we are indebted for the information upon which this article is based.

More Prize Awards

SUPPLEMENTING the reports of annual track inspections presented on page 32 of the January issue, a report covering the award of prizes in the New York zone of the Pennsylvania and one covering the results of the annual track inspection on the Chesapeake & Ohio have been received. Abstracts of these reports, including the names of the winners of the various prizes, appear below.

New York Zone—Pennsylvania

The "Klondike" prize for the best line and surface in the New York zone of the Pennsylvania during 1931 was awarded to P. X. Geary, supervisor, subdivision No. 1, with headquarters at Pennsylvania station, New York, as a result of the annual inspection. W. C. Gretzinger, assistant supervisor on the same subdivision was also awarded a prize. On the Long Island part of the zone, subdivision prizes were awarded to Lee Spencer, supervisor, subdivision No. 1, at Woodside, N. Y., and to W. T. Hammond, assistant supervisor, subdivision No. 1.

The general manager's award to track foremen on the New York division of the zone who had maintained the best sections on each supervisor's subdivision, were made to John Tanzini, subdivision No. 1. at Newark, N. J.; Nicola Cifelli, subdivision No. 2, at Bay Line, N. J.; Emri Remetta, subdivision No. 3, at Iselin, N. J.; and M. A. Burchell, subdivision No. 4, at Tullytown, Pa. On the Long Island, general manager's awards were made to the following foremen: Michael White, subdivision No. 1, Winfield Junction, N. Y.; Frank Ciccio, subdivision No. 2, at Floral Park, N. Y.; Harry Deckow, subdivision No. 4, at Amagansett, N. Y.; and Salvatore Piscitelli, subdivision No. 5, at Central Islip, N. Y. Awards to foremen in branch line territory were made to Albert Smith, subdivision No. 8, at Jamesburg, N. J., and to William Johnson, subdivision No. 9, at Raven Rock, N. J.

Careful Inspection Made on C. & O.

Following the annual track inspection on the Chesapeake & Ohio, including the Hocking Valley, a considerable number of cash prize awards were made to track supervisors and foremen, following the procedure that has been in vogue for several years. Prizes of $50, $40, and $30, respectively, were awarded to the supervisors, except that in certain groups or territories the third prize was omitted. Prizes of $25 and $15 were awarded to the foremen having the first and second best maintained sections in each supervisor's territory, and two special prizes of $50 each were awarded to the supervisors whose territory showed the greatest improvement during the year. Following is a list of the five main classifications and the names of the supervisors winning the group prizes:

Group 1—Double-track main line, freight and passenger service: First prize—W. P. Nichols, Ohio River district; second prize—J. H. Arthur, Cincinnati district; third prize—J. L. Brightwell, Huntington district.

Group 2—Single and double-track main lines, principally freight traffic: First prize—R. R. Burchertt, Barboursville district; second prize—J. F. Painter, James River subdivision; third prize—F. P. Barrick, Paintsville district.

Group 3—Single-track main line, principally passenger traffic: First prize—R. H. Gibson, Mountain subdivision; second prize—C. A. Snodgrass, Wabash district.

Group 4—Secondary branch line: First prize—W. L. Bennett, Loup Creek subdviision; second prize—C. H. Ward, Pomeroy subdivision.

Group 5—Yard and terminal territories: First prize—F. A. Dirnbirg, Maumee district; second prize—G. T. Lamblin, general foreman, Russell division.

The improvement prize of $50 awarded among the supervisors of Groups 1 and 2, was given to H. S. Chandler, supervisor on the Rivanna subdivision, and the similar prize awarded in Groups 3, 4 and 5, was given to W. L. Bennett, the winner of the first prize in Group 4.

Burlington Develops Data on Z. M. A. Treated Wood

DURING the last five years, the Chicago, Burlington & Quincy has used zinc meta-arsenite for the preservative treatment of more than a million cubic feet of wood in the form of crossties, poles, piling, crossing plank, bridge timbers, etc. The ties and timbers so treated have been inspected periodically for the purpose of observing the service rendered, particularly 16,408 crossties embracing three different species of wood which have been installed in test sections on the Aurora and LaCrosse divisions.

One practical result of the experience with this new treatment is its adoption as the standard for telegraph poles, crossing plank and the top or wearing course of plank for highway bridges. In addition, two overhead highway bridges built entirely of Z.M.A. treated material were placed in service last year, while there are installations also of switch ties and of lumber applied to various miscellaneous uses. Detailed figures covering the use of material treated with Z.M.A. during the last five years are given in the table in the next column.

The characteristics and properties of this preservative, which were described in *Railway Engineering and Maintenance* for April, 1928, page 180, are briefly those of a salt that is not water soluble.

Data From Recent Inspections

While it is realized that accelerated tests of any preservative are not universally accepted as conclusive proof that the demonstrated toxic properties will insure the desired longevity of wood impregnated with it, no material treated with Z.M.A. by this railroad affords indica-

tions as yet of any discrepancy between the accelerated tests and the field tests that are being observed. Thus, in a recent inspection, 174 pieces of 6-in. by 6-in. by 8-ft. timbers and 270 pieces of 2-in. by 8-in. by 16-ft. planks installed as guards in the Ohio Street viaduct at Aurora, Ill., in 1928, were found to be free from decay. Similarly, Southern pine poles placed in telegraph lines on the La Crosse division in the same year showed no indication of decay, although some of them were checked.

Cubic Feet of Material Treated with Zinc Meta-Arsenite

	1928	1929	1930	1931	Total
Piling		6,542	1,121	9,886	17,549
Poles	257,293	212,584	272,568	239,194	981,639
Fir Lumber	1,713	12,723	14,967	8,305	37,708
Track Ties*	41,232	2,789		6,464	50,485
Switch Ties		274	579	9,126	9,979
Nailing Strips		9,593	1,792		11,385
Gum Crossing Plank			1,960	1,360	3,320
Maple Lumber			2,482	2,788	6,270
Oak Plank			1,229		1,229
Oak Lumber				937	937
					1,120,501

*In 1930, 23,314 cu. ft. of track ties were treated with Z.M.A. and petroleum oil mixture.

However, the checking noted was not as severe as that ordinarily occurring in cedar poles, while it is believed that if decay were to occur in these poles there would be some indications at this time.

Southern pine piling treated with this preservative were driven in the Mississippi river at Quincy, Ill., to serve as part of a draw-span protection, and a recent inspection likewise disclosed no decay. For service of this kind where the piles are entirely or partly submerged, the road insists that the wood be thoroughly air-seasoned after treatment to insure the complete evaporation of the acetic acid in the preservative, and thereby protect against the leaching out of appreciable amounts of the toxic salts.

Study Crosstie Installations

The installations of Z.M.A. treated ties are two in number, one on the Aurora division at Lisle, Ill., comprising 1,894 pine, 1,753 oak and 1,945 gum, and the other on the La Crosse division, embracing 4,936 gum ties, 3,024 oak ties and 2,856 pine ties. As the former group was inserted in 1930 whereas the latter were placed in track in 1928 and embraces a larger number of pieces, comment will be confined to the ties in track on the La Crosse division. These ties are also of particular interest because they were subjected to a test for electrical resistance conducted by W. F. Zane, signal engineer. A thorough inspection of these ties made last fall, in the course of which many increment borings were taken, disclosed no evidence of decay. Likewise, a considerable number of spikes removed from these ties indicated a rate of corrosion for three year's service that was no greater than that ordinarily observed in spikes driven in other ties for the same service period. Data on the relative electrical resistance of ties treated with this preservative are given in the following abstract of a report prepared by Mr. Zane.

Tests for Electrical Resistance

The tests conducted on the La Crosse division were limited entirely to new second track laid in November, 1928, in which the ties had been purposely segregated as to both treatment and species, and embrace eight track circuits with Z.M.A. treated ties and five with ties treated with the Card process (zinc chloride and creosoted oil). These circuits vary from 1,980 to 2,470 ft. in length. The track is all laid with 100-lb. A.R.A. Type-A rail, the ties are spaced 22 to the rail and are fully tie-plated. The ballast is cinders dressed to the tops of the ties at the track center and clearing the rails one inch.

Each of the track circuits under test is fed from a seven-plate lead-acid storage battery, which is on a-c. floating charge, through a rectifier operating from a 220-volt, 60-cycle, single-phase power line. Four-ohm track relays are used and each relay is equipped with four front and two back contacts. Each rail joint is bonded with two Copperweld bond wires bonded into the web of the rail with duplex channel pins. The insulated joints are of the continuous type for 100-lb. rail. All of the equipment required for these track circuits was installed new according to the railway's standards. The test was started in August, 1929, when the track was placed in service.

Track readings of circuits where Card process-treated ties are in service, showed a very erratic performance during wet weather. Under normal dry conditions, the ballast resistance for the track circuits where the ties were treated with Z.M.A. averaged 9 to 10 ohms, compared with 3.5 to 6 ohms for the track circuits where the ties were treated by the Card process. In wet weather the ballast resistance for the Z.M.A. sections was 2 to 3.5 ohms, compared with 0.5 to 1 ohm for the Card tie sections.

These tests were conducted to determine the relative economy of the two types of treatment, in so far as track circuit operation is concerned. The results, as shown in the table below, are based on the power consumption with the track circuit unoccupied, and an allowance of 20 per cent has been made for losses in the transformer, rectifier and line.

Table Showing Comparative Costs of Track Circuit Operation

Track Circuit	Treatment	Kind of Wood	Current from Battery	Watts Consumed	Cost Per Year for Current for Track Circuit
A	Z.M.A.	Oak	.280 Amp.	7.00	$3.68
B	Z.M.A.	Oak	.220 "	5.5	2.89
C	Z.M.A.	Gum	.290 "	7.25	3.81
D	Z.M.A.	Gum	.280 "	7.00	3.68
E	Z.M.A.	Gum	.200 "	5.00	2.62
F	Z.M.A.	Gum	.210 "	5.75	2.76
G	Z.M.A.	Pine	.230 "	5.75	3.02
H	Z.M.A.	Pine	.440 "	11.00	5.78
*I	Z.C.	Oak	.600 "	15.00	7.88
*J	Z.C.	Oak	.530 "	13.25	6.96
*K	Z.C.	Oak	.525 "	13.13	6.90
*L	Z.C.	Oak	.500 "	12.50	6.57
*M	Z.C.	Oak	.400 "	10.00	5.25

*These sections are track circuits with ties treated by the Card process using zinc chloride and creosote oil. The ties were treated at the same time and installed at the same time as the Z.M.A. treated ties.

Thus, in the last column of the table it will be seen that the cost per year for current consumption by the track circuits ranged from $2.62 to $5.78 in track laid with Z.M.A. ties and from $5.25 to $7.88 in track laid with Card ties. Comparing the five Z.M.A. circuits showing the greatest current drain with the five Card tie circuits, the saving in favor of the former was $13.59 per year. With the five Z.M.A. circuits showing the least current drain, however, the saving was $18.59.

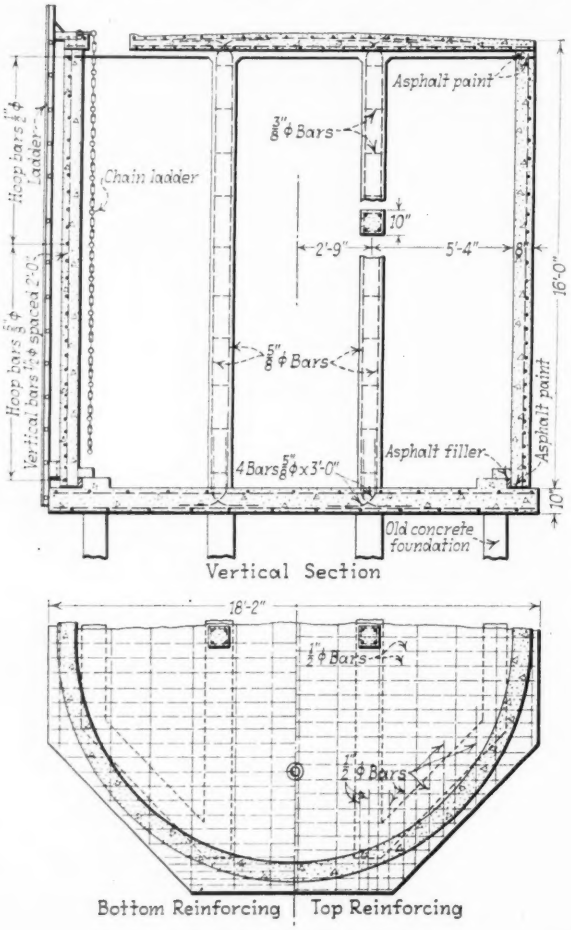
This timber has been treated under the supervision of H. R. Duncan, superintendent of timber preservation, Chicago, Burlington & Quincy, to whom we are indebted for all the information presented above other than that taken from Mr. Zane's report.

Use Concrete Tanks in Hot-Water Service

By W. C. REICHOW
Inspector, Great Northern, St. Paul, Minn.

BECAUSE the waterproofing of a reinforced concrete hot-water tank overcame entirely the leakage which had previously taken place, it is believed that an account of the exact manner in which this waterproofing was done will prove of interest.

The tank was placed in service in the engine terminal of the Great Northern at St. Cloud, Minn., in January, 1931, where it is used as a part of the boiler washout and refilling system. It has an inside diameter and height of 16 ft. 2 in. and 15 ft. 8 in., respectively, and has a capacity of about 23,000 gal. The base slab, 10 in. thick, rests on an old concrete foundation that previously supported a wooden tub. The side walls of the new reinforced concrete tub are 8-in. thick. The roof slab varies in thickness from 4 in. at the edge of the slab to 7 in. at the center, and is supported on the side walls and on two reinforced concrete columns 10 in. square that extend from the top of the base slab. Expansion joints are provided at the junction of the side walls with the base slab, and at their junction with the roof slab.



General Details of the Tank at St. Cloud, Minn.

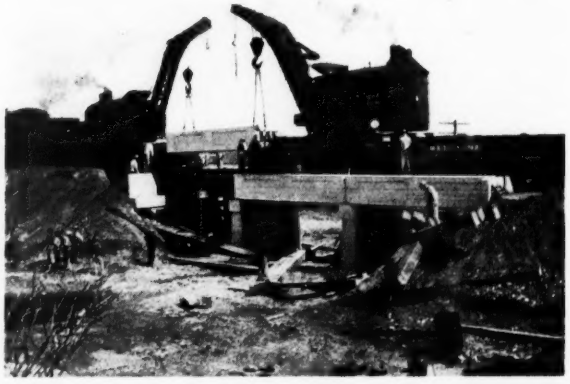
The forms for the side walls were of wood, and were made up in sections 4 ft. high. An attempt was made to pour the side walls in a continuous operation, but because considerable time was consumed in erecting the form sections, horizontal construction joints occurred between successive tiers of forms.

The concrete proportions were 1:1¾:2½ by volume, with only sufficient water to produce a workable mix. Each batch of concrete was mixed for at least two minutes, and the concrete was placed in the forms in small batches and thoroughly spaded. The coarse aggregate consisted of washed gravel of one-inch maximum size, and the fine aggregate of washed sand. The test cylinders, which were made during the progress of the work, showed an average compressive strength of 3,830 lb. per sq. in. at the age of 28 days. No admixture was used, and the inside surfaces of the tank were not waterproofed at the time of construction.

The tank was placed in service about two weeks after completion and remained water-tight for two weeks after which time seepage was observed at the horizontal joints. This leakage resulted in an insignificant loss of water but produced an unsightly appearance and raised questions as to the effect on the concrete that led to the decision to waterproof the side walls.

The tank was drained and allowed to dry out for a period of three days. The inside of the side wall was then cleaned with wire brushes and scraped to remove all deposits of scale. The horizontal cracks, which were then visible, were chiseled out to a depth of about ⅜ in., after which a brush coat of a mixture of water and Ironite was applied. These cracks were then filled with a paste consisting of a mixture of cement and Ironite. After this treatment was allowed to dry for about 12 hours, a brush coat of asphalt primer was applied to the entire inside surface of the tank and a heavy coat of hot asphalt waterproofing (battery seal) was applied on the surface at the location of the cracks that had been repaired. The tank was then filled with cold water, which was gradually heated for service. Up to the present there have been no signs of further leakage and the tank has been giving entirely satisfactory service.

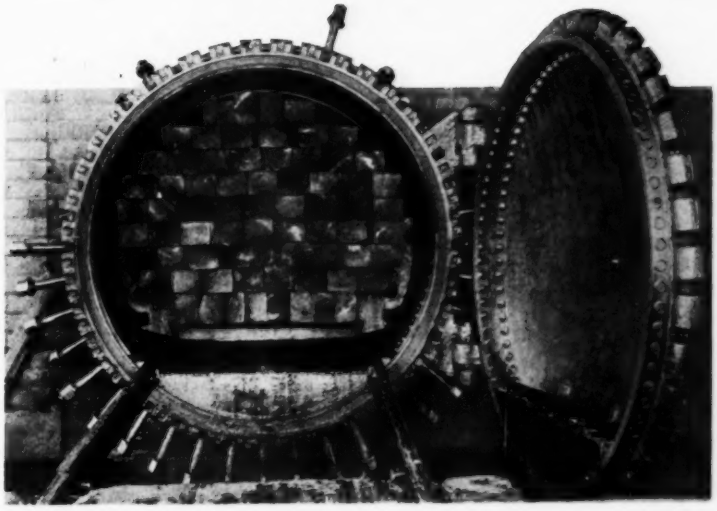
This is the second reinforced concrete hot-water tank installed by the Great Northern. The first tank, constructed at Great Falls, Mont., during 1927, is still giving satisfactory service. The concrete tanks can be installed at a cost slightly less than that for steel tanks, and inasmuch as the concrete tanks require practically no maintenance, it is thought that they may prove to be the more satisfactory. In case additional reinforced concrete tanks are constructed, one or more coats of asphalt waterproofing will be applied to their inside surfaces before placing them in service.



Setting in Place a Precast Reinforced Concrete Trestle Slab on the Missouri-Kansas-Texas

Service Records Prove Worth of Treated Timber

Wood-Preservers debate greater attention to the increased life of railway applications at the convention at St. Louis



INCREASING recognition of the value of treatment with preservatives as a means of prolonging the service life of timber was clearly brought out at the twenty-eighth annual meeting of the American Wood-Preservers Association at St. Louis, Mo., on January 26-28. Addresses on Thirty-Two Years' Experience with Treated Ties on the Chicago & Eastern Illinois, by J. S. McBride, chief engineer of that railway; on Creosoted Pile Foundations for Railway Structures, by F. R. Judd, engineer of buildings of the Illinois Central; on the Treatment of Bridge Timber and Piling on the Atchison, Topeka & Santa Fe, by R. A. Van Ness, bridge engineer of that system; and reports of committees on Tie Service Records, on Bridge and Structural Timber, on Post Service Records, and on The Treatment of Car Lumber and of Poles indicate the major place that the railways occupy as the chief user of treated timber. The convention also gave detailed consideration to refinements in the processes of treatment as presented by committees and by representatives of the American and Canadian forest products laboratories.

300 Attend Convention

Approximately 300 members and guests attended the meeting, all sessions of which were presided over by John S. Penney, vice-president of the T. J. Moss Tie Company, St. Louis, Mo. At the closing session on Thursday morning, Elmer T. Howson, editor of *Railway Engineering and Maintenance*, was elected president; R. S. Belcher, manager, treating plants, Atchison, Topeka & Santa Fe, Topeka, Kan., first vice-president; S. R. Church, consulting engineer, New York, second vice-president; H. L. Dawson, secretary-treasurer (re-elected); and F. C. Shepherd, consulting engineer, Boston & Maine, Boston, Mass., and B. M. Winegar, Canada Creosoting Company, Montreal, Que., directors. Chicago was selected as the location for the next convention, which will be held on Jan. 24-26, 1933.

Features of the program of particular interest to railway men are reviewed in the following columns, except the papers by Mr. Judd and Mr. Van Ness which will be published in later issues.

Increasing Diversification

After calling the convention to order, President Penney reviewed conditions within the industry. He stated that the wood preserving industry is now working at about 50 per cent capacity as compared with an all-time maximum of 80 per cent, a not unfavorable situation as compared with other industries, especially when consideration is given to the marked decline in the requirements for treated ties in recent years, resulting from the increase in their life brought about by treatment. This decrease is being overcome largely by the rapid growth in the treatment of poles, structural timber, etc., for railway and industrial uses. Mr. Penney urged greater interest in the search for new applications of treated timber in the interest of ultimate economy.

Mr. Penney then introduced R. C. White, assistant general manager of the Missouri Pacific, who, in the absence from the city of L. W. Baldwin, president of that road, presented an address prepared by Mr. Baldwin on the conditions now confronting the railways. Starting with the statement that one of the principal difficulties in the railway situation is the result of a surplus of transportation, he cited the various forms of subsidized competition confronting the railways, virtually all of which, he said, are practically without regulation. "There is no objection to inland water transportation, as such," he continued, "nor is there any objection to transportation on the highways or in the air, but it seems most unfair that the agencies of government should be utilized to weaken, and possibly break down and destroy, the railroad plant that must constitute the backbone of our transportation system for years to come. The answer to the railway situation is easy to find and difficult to

apply. Briefly, the government must get out of the business of competing with private enterprises in the way it now is. The time is here for the thinking people of this country to face the facts, wake up and do something about it."

Tie Service Records

In addition to presenting tabular reports on test tie installations of several railways, the Committee on Tie Service Records prepared an extension of its table of crosstie renewals per mile of track, to include the renewal data of 25 roads for 1930. The averages for 1930, taken from this table, are presented below:

Road	Renewals per Mile of Track 1930	Five Year Average
A. T. & S. F.	161	151
B. & O.	120	170
C. B. & Q.	151	162
C. & E. I.	99	122
C. C. C. & St. L.	80	98
C. M. St. P. & P.	200	249
C. R. I. & P.	128	144
D. L. & W.	74	87
G. N.	194	209
I. C.	181	189
K. C. S.	165	143
L. V.	64	68
M. C.	94	123
M.-K.-T.	163	214
N. Y. C. (East)	111	144
N. Y. C. (West)	66	82
N. P.	124	141
Penna.	120	165
M. St. P. & S. S. M.	222	258
S. P. (Atlantic System)	161	208
S. P. (Pacific System)	164	210
U. P.	113	166
C. R. R. of N. J.	83	80
Reading	121	148
C. & O.	173	221

Diversified Uses of Treated Wood

In a report on opportunities for the profitable use of treated wood for purposes for which it is not now generally applied, a committee reviewed the general considerations involved and presented a tabulation of potential uses, of which the following are applicable to the railway field.

Foundation piles for buildings.

Product—Piles, creosoted.

Advantages—Centuries of successful service have established the structural efficiency of wood piles for foundation support. Engineers today, basing their conclusions on the practice of the last half century, concede permanence also to properly creosoted piling when buried in the earth with their tops embedded in concrete. Foundation costs can be substantially reduced by the use of creosoted piles instead of more expensive types.

Grade separation, bridges and bridge floors.

Product—Timber bridge members such as piles, caps, stringers, flooring, guard rail and floor planks or block floors for steel bridges, creosoted.

Advantages—Treated timber bridges are low in first cost, and economical. Treated timber bridge floors result in lower dead loading than other types.

Floors and roofs of buildings.

Product—Roof plank, rafters, studding, sills, floor joists, subflooring, nailing strips, floor plank and flooring blocks, creosoted or treated with zinc chloride.

Advantages—Timber possesses many inherent advantages over substitute materials for building construction. While untreated lumber lacks the durability to render its use economical under many conditions, treated lumber possesses durability under all conditions.

Retaining walls and cribbing.

Product—Round or sawed timbers, creosoted.

Advantages—The first low cost, durability, and satisfactory structural characteristics, with ease of handling without special equipment, make the timber crib an ideal structure for preventing slides, retaining fills, and protecting eroding stream banks.

Posts—fence, guard rail and sign posts.

Product—Round or sawed posts, creosoted.

Advantages—Maintained strength, reduced fire hazard, and permanence require pressure treatment of fence posts.

Crossing planks.

Product—Planks creosoted.

Advantages—Economical service permitting access to track structure.

For most of the above uses, there are several species of timber which can be used satisfactorily and the selection will be largely a matter of choosing the most satisfactory species in respect to mechanical properties and the adaptability of the treatment available.

In addition to the above uses, there is practically unlimited applications in structural, building and manufacturing requirements where the particular qualities of treated wood can be used with resultant advantages in permanence and economy. Below is a partial list of such uses where treated wood has been employed to a varying extent, and where the results obtained justify further use by the railways.

Base plank—support of cross-arms
Cross-arms — telephone and power field
Culverts
Drop doors for coal cars
Fire doors — industrial type buildings
Flumes
Guy anchors
Ice houses
Loading platforms
Nailing strips
Pipes
Scale houses
Section houses
Septic tanks
Sheet piling
Sign boards
Sleepers—industrial buildings
Snow fences
Stock pens
Strain guy insulators
Wales—general construction
Water tanks

Experimental Treatment of Hardwood Ties

J. F. Harkom, chief, Division of Wood Preservation, Forest Products Laboratory of Canada, presented the results of some experimental work on the treatment of birch, maple and beech ties. The first section of his study had to do with the relative benefits of incising ties before and after seasoning preparatory to treatment with 6.85 lb. per cu. ft. of a 70:30 creosote-coal tar mixture. It was conducted by applying one procedure to one unit of several pairs of ties cut from individual trees and applying the other procedure to the other ties from the same pairs and comparing the matched ties in the test track in which they were inserted. His conclusions are as follows:

1. Incising before air-seasoning had no appreciable effect on the rate of air-seasoning or the moisture content after air-seasoning.
2. Incising before air-seasoning did not increase the absorption or penetration of the treating mixture.
3. Incising before air-seasoning slightly reduced checking in ties air-seasoned four to five months, and the indications are that the reduction in checking would be more noticeable when ties are held in the seasoning yard for a longer period.

The second section of the study was concerned with the relative absorption of preservative by ties of the three species and showed that while maple and beech absorb creosote at about the same rate, birch absorbs it faster. His conclusion is that birch ties should be segregated for treatment, while maple and beech ties may be treated together.

Other Reports

The Committee on Preservatives reported on a number of assignments of a technical nature. It presented the conclusion that there is no need "for changing existing specifications for creosote to avoid adulteration.

If the oil does not fully meet the identification test, now a part of the standard specification, it should be looked upon with suspicion." It is also engaged in a study of creosote-petroleum treatments of ties and timbers with the objective of preparing specifications for petroleum and possibly also for creosote for use in admixtures.

The Committee on the Pressure Treatment of Poles presented a progress report on some studies of bleeding and checking but stated that the work had not yet proceeded far enough to warrant the formulation of specific recommendations for overcoming these conditions. The Committee on the Non-Pressure Treatment of Poles presented a revised specification for non-pressure treatment, non-incised method, to conform with the specification for non-pressure treatment, incised method. An elaborate report on pole service records was presented in the form of an abridgement prepared by the Committee on Poles Service Records of an unpublished report of the American Telephone and Telegraph Company based on an exhaustive study of several pole lines of that company upon which careful service records have been kept for periods up to 30 years. In general, however, the installations are not yet old enough to afford an accurate measure of the full service life of pressure-treated creosoted poles.

The subject of marine piling was considered in a brief progress report by the Committee on Marine Piling. Service records were presented on the life of creosote piles in Seattle and Tacoma harbors, supplied by the Northern Pacific, covering periods of service up to 23 years.

A paper by J. D. MacLean, senior engineer, Forest Products Laboratory, Madison, Wis., explained the details of a study of heat conduction in wood, as a result of which it is possible to select steaming conditions that will give similar temperatures, for a definite depth, in green sawed southern pine timbers. However, according to the paper, it is, of course, not known just what the temperature of a timber should be at any given point to obtain the optimum penetration of preservative but a knowledge of the temperatures that may be expected makes it feasible to work out steaming schedules on a much more scientific basis than has been possible in the past. With this information experiments can be made that will show within reasonable limits the depth and degree of temperature to which a given size of timber should be heated for the steaming treatment to be most effective.

A progress report, the third to be presented, on an international termite exposure test, was submitted by George M. Hunt, Forest Products Laboratory, Madison, Wis., and T. E. Snyder, Bureau of Entomology, Washington, D. C. This reviewed the condition of specimens in various test installations in the Panama Canal zone, Australia and elsewhere, and included tabular records of the condition of specimens, classified according to the preservative employed. The authors, however, cautioned against the drawing of any definite conclusions from the data available at this stage in the tests.

Progress in the study of 61 chemicals with respect to their effect on the fire resistance of wood was reported in a paper by G. M. Hunt, T. R. Truax and C. A. Harrison of the Forest Products Laboratory, Madison, Wis. Particular attention was devoted to boric acid, mixtures of boric acid and borax, and to mixtures of borax and monoammonium phosphate, which rank among the more effective of the chemicals studied. Brief progress reports were presented by committees on the Processing of Wood, on The Treatment of Car Lumber, on Bridge and Structural Timber and on Post Service Records.

Thirty-Two Years Experience with Treated Ties

By J. S. McBRIDE

Chief Engineer, Chicago & Eastern Illinois

AFTER applying a small lot of treated ties in 1897, the Chicago & Eastern Illinois commenced the treatment of ties on a large scale in 1899 and increased the proportion of treated ties from year to year. The first treatment adopted was the Wellhouse process, using ½ lb. of zinc chloride per cubic foot of timber, and this treatment was employed until the end of 1905. The Burnettizing process was adopted in the following year and has been applied since that time. From 1906 to 1914, treatment with zinc chloride provided a retention of ⅓ lb. per cu. ft., but subsequent to 1914 this was increased to ½ lb. per cu. ft. The treatment of ties with creosote oil was started in 1907, using 2½ gal. per tie. A mixture of 80 per cent creosote oil and 20 per cent coal tar is now being used.

A considerable number of untreated ties were applied during the first six years after the use of treated ties was taken up, but subsequent to 1905 the number of untreated ties was decreased each year with the result that in 1915, when the Interstate Commerce Commission inventoried the property in connection with federal valuation, only a fraction over 8 per cent of all crossties in track were untreated.

The treatment during the period from 1907 to 1914 was about equally divided between creosote and zinc chloride, after which a reduction was made in the use of zinc chloride with a corresponding increase in the use of creosote until the war period, when, because of the scarcity of creosote oil, it was necessary to return to the zinc treatment for several years. Since 1924 creosote has been used exclusively and is now the standard preservative on the C. & E. I.

A limit has been placed on the size of ties purchased, the standard being 6-in. by 8-in. by 8-ft., although at times not to exceed 25 per cent of the total quantity purchased has been accepted in the sizes 6 in. by 7 in. and 6 in. by 6 in. by 8 ft. for side-track use. The kinds of wood accepted are A. R. E. A. groups TA, TC and TD, but at least 80 per cent must be of group TA. Most of the ties received are red oak, which wood is preferred because it will take treatment readily and offers resistance to mechanical wear.

Rigid Seasoning Requirements

The requirements of the specifications for purchase provide that ties shall be made from trees felled not over one month and that they must be delivered within one month after being made. They must be straight, well manufactured, have tops and bottoms parallel and the bark entirely removed. All ties must be free from any defects that may impair their strength or durability, such as decay, splits, shakes and large or numerous holes or knots.

It is the practice to purchase ties untreated and have them treated at a commercial plant. The C. & E. I. considers the purchase of untreated ties very important as this gives the railroad control of the ties from the beginning and insures that only fit ties shall be treated. During the entire period that treated ties have been used, a high standard of inspection of the ties and the treatment has been maintained and will be continued.

The necessity of protecting treated ties in track from

mechanical wear is beyond question and can best be provided by the application of adequate tie plates. During the early period of the use of treated ties, this was not done as generally as it is today. For the past 15 years it has been the practice to place tie plates on all new ties applied in main track. Beginning in 1928, when the section of rail was increased, it became the practice to apply tie plates out of face to all ties on which new rail was laid, in addition to continuing the previous practice of plating all new ties placed in main track. At the present time about 50 per cent of all ties in track are provided with tie plates. Use is being made of S-irons to prevent ties from splitting. They are applied to any tie showing a tendency to split during seasoning, and section forces are provided with a supply of irons for application to any ties that show a tendency to split after treatment.

It is not the practice to pre-bore or pre-adze the ties. There are so many sections of rail in track that pre-boring is not considered practical. Many ties are sawn, thus reducing the necessity for pre-adzing. Any ties adzed in track are brushed with creosote oil. Creosoted tie plugs are also used to fill old spike holes.

Thirty-two years use of treated ties has resulted in reducing the annual renewals from around 300 to about 110 per mile, although in some years they have been ever lower. The table gives a summary of the number of ties renewed per mile of track for each year from 1900 to 1931, inclusive, together with the five-year averages.

		Ties Renewed per Mile of Track	
Year	Miles	Each Year	5 Year Average
1900	1,061	284	...
1901	1,107	290	...
1902	1,146	228	...
1903	1,188	198	...
1904	1,251	133	227
1905	1,391	109	192
1906	1,479	148	163
1907	1,493	217	161
1908	1,507	199	161
1909	1,514	121	159
1910	1,522	200	177
1911	1,520	134	174
1912	1,972	189	169
1913	1,008	289	187
1914	2,046	202	203
1915	2,055	255	214
1916	1,892	244	236
1917	1,871	187	235
1918	1,880	166	211
1919	1,867	141	199
1920	1,865	102	168
1921	1,863	63	132
1922	1,654	131	121
1923	1,662	158	119
1924	1,661	92	109
1925	1,663	86	106
1926	1,662	112	116
1927	1,671	121	114
1928	1,675	122	107
1929	1,675	120	112
1930	1,674	93	113
1931	1,674	89	109

More definite than the renewal per mile of track is the percentage renewed. Taking advantage of the valuation inventory and applying to this the subsequent additions and deletions, it has been found that during the past 15 years, the average annual renewals of cross ties on the C. & E. I. have been 4.09 per cent of the total ties in track, indicating an average life of 24.4 years, and this from a combination of creosoted and zinc treated ties in addition to some untreated ones.

In 1918 a test section of 11,095 ties was established that included untreated white oak; red oak; beech and gum treated with ½ lb. of zinc chloride; red oak with ⅓ lb. of zinc chloride; and red oak, elm and beech treated with 2½ gal. of 80-20 creosote per cubic ft. The ties on curves and all gum ties were the only ones plated originally although some additional plates have been applied since. A very complete record is being kept of these ties and of the results obtained and they are being inspected annually to determine which have been or should be renewed.

Of the untreated white oak ties, 99.7 per cent have been removed for all causes and the average life of those removed was 9.78 years. Of the ½ lb. zinc-treated ties, 92.9 per cent have been removed for all causes, those removed having an average life of 13.7 years. The life of the group as a whole will average more than 14 years.

The ⅓ lb. zinc-treated ties are showing less life than those having the ½ lb. treatment as might be expected, 96.5 per cent having been removed for all causes and the average life of those removed was 12.2 years.

It is too early to make a prediction as to the life to be obtained from the creosoted ties. After 19 years, 96.2 per cent of the creosoted ties are still in track and of those removed, some have had to be replaced because of derailments.

Track Foreman Involved in Wreck Caused by Open Switch

IN AN accident on the Atlantic Coast Line on September 25, 1931, in which a freight train was wrecked when it ran through an open switch onto a spur track, the evidence presented in the report of the Bureau of Safety of the Interstate Commerce Commission pointed to the fact that the switch might have been left open by a track foreman or a member of his gang in violation of rules regarding the operation of motor cars, although this could not be ascertained definitely. The accident resulted in the death of the fireman and the conductor and the injury of the engineman and the head brakeman of the train. The following facts regarding the accident were abstracted from the report of the Bureau of Safety:

After the accident, which occurred at Haines City, Fla., at 9:25 p. m. on a somewhat misty night, the switch was found to be lined and locked for the spur track. The engineman stated that he did not see the red indication of the target until within 300 ft. of the switch.

The investigation of the accident brought out the fact that a section gang, consisting of the foreman and four track men, had worked in the vicinity of the spur track on the day of the accident and that during the noon hour the gang ran the section motor car in on the spur track, which had not been used by trains for several days. When questioned after the accident, the foreman maintained that the motor car was lifted over the switch on both the in and outbound movements and that throughout the day he had no occasion to use the switch. When reminded of the fact that it was a violation of the rules to set a motor car on a side track, he replied that in this case he thought it justifiable. Two members of the track gang stated that on moving the car from the spur track onto the main track the foreman opened the switch to allow the car to be pushed out, while the other two maintained that the motor car was lifted over the switch. Subsequently, however, all of the trackmen stated that the car was lifted over the switch.

In its conclusions, the Bureau of Safety stated that "while there were circumstances to indicate that Section Foreman ————, or a member of his crew, might have left the switch open, the foreman emphatically maintained that neither he nor any of his crew had handled the switch on the day in question, and that at the time of the investigation it could not be definitely determined exactly when or by whom the switch was opened."

What's the Answer?

Have you a question you would like to have someone answer?

Can you answer any of the questions listed in the box?

Shimming Track

What methods should be employed and what precautions are necessary in shimming on high-speed tracks to insure that the track will remain in condition for the maintenance of normal speeds ?

Line and Spiking Require Attention

By W. R. GARRETT

Yard Foreman, Chicago, Burlington & Quincy, Pacific Junction, Ia.

In my opinion, shimming can be done with safety on high-speed tracks, provided close attention is given to the line of the track and special care is exercised to insure that the spiking and bracing of the rail are done securely. Shims up to ¼ in. in thickness should be inserted under the tie plate and double spiked on the inside of the rail with standard track spikes. For shims of this thickness, it is not necessary to use braces.

If the shims are ½ in. thick, they can also be inserted under the tie plate, but in this case 6-in. spikes and the usual form of bracing with shims should be employed. Track that requires shims thicker than ½ in. should be picked out and surfaced, provided it is not heaved. If the shims are required because of heaving and are more than ½ in. thick, a slow order should be put on the track to insure safety.

Watch Line, Level and Surface

By Engineer Maintenance of Way

It seems preferable to mention first some of the precautions that should be observed in shimming track. To my mind the most important factors are the cross level and the line. Heaved track is usually out of level, sometimes seriously so, and frequently is out of line. These defects must be corrected if it is to remain safe for high speeds. Obviously, heaved track is badly out of surface, this being the defect that usually comes to mind when we discuss the subject, or that we notice most in riding over it.

When shimming, all of these defects should be given equal attention. Where the heaving is light, it is not particularly difficult to make suitable runoffs in both directions from the high point. Where it is somewhat greater, the runoffs will necessarily be somewhat longer, and longer spikes and the use of braces may be necessary. In either case, the objective should be to do the work in a manner that will correct the line and level and make the runoffs as easy as practicable.

If the heaving is excessive, say from 1 in. to 10 in., and I have seen track heave as much as 10 in., a different procedure is required. Instead of relatively short shims under each rail, it becomes necessary to introduce timbers of sufficient length to extend under both rails. These timbers should be fastened securely to the ties upon which they are laid, by means of wood screws, boat spikes or drift bolts, depending on their thickness, to eliminate the possibility of lateral movement of the track. The tie plates should be removed from the ties and inserted between the rails and the timbers. The usual type of shim can then be used to level up the track or, better still, the timbers can be adzed to obtain the required level.

To Be Answered in April

1. Where the track has heaved, what precautions, if any, should be taken and what methods should be employed in the removal of shims while the frost is leaving the ground and the track is settling?

2. Should a primer be applied to a concrete surface before waterproofing materials are added? Why?

3. At what season or in connection with what other work can gaging be done to best advantage? Should it be done out of face? Why?

4. What are the relative advantages of welded joints and joints made with screwed couplings or bolted flanges for hot and cold water lines, and low pressure steam lines? Are welded joints suitable for high pressure steam lines? What are the limitations, if any, of welded joints?

5. When track is not out of surface, but some of the ties are loose, can these ties be tamped satisfactorily with power tampers without first giving the track a slight raise? Do the character and size of the ballast make any difference? Why?

6. What are the relative advantages and disadvantages of stone and concrete curbs for brick platforms? What advantages, if any, do precast concrete curbs possess over cast-in-place concrete curbs?

7. What defects require the removal of rail from main tracks? What defects, if any, are permissible in rail that is laid in sidings?

8. Should each division of a railway be given a permanent assignment of pile-driver equipment? If not, how should the assignment be made, and how can the routine work of driving piles be handled?

In cases of excessive heaving it is sometimes good policy to adze the track ties as much as two or three inches at and for some distance on either side of the high point, in order to reduce the amount of extra timber that is put under the rail.

A foreman who lacks experience with heaving track should never be allowed to do shimming, except under close supervision for this work requires both skill and seasoned judgment. Even a slight digression from the proper procedure may result in a derailment. Short run-offs cause discomfort to passengers and, of greater importance, may result in broken locomotive springs, broken arch bars on freight cars, and broken equalizer bars on passenger-car trucks, as well as broken journal boxes on both types of equipment.

Shimmed track sometimes spreads easily, even where it is apparently well braced. For this reason, it is good practice to use gage rods freely, particularly on curves. Where the amount of shimming is excessive or the heaving is of considerable magnitude, it may not be practicable to maintain normal speeds over the section of track involved. Here again, judgment born of experience is important, and a foreman or supervisor should never hesitate to apply a slow order when, in his opinion, this is necessary.

Accuracy of Panel Spacing

When driving pile trestles, how accurately can the bents be made to conform to the standard panel spacing where the structure has been renewed several times? What difficulties must be met and overcome ?

Can Be Done Very Closely

By E. M. GRIME

Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Where a pile trestle has been redriven a number of times and, as frequently happens, with spans of different lengths, as a result of changes in standards, it is usually best to have a survey made to determine the location and spacing of the old bents before rebuilding is again undertaken.

With this information available, a drawing should be made to scale, to show the remains of each old bent. By laying this over another drawing to the same scale, which shows the present standard bent spacing, it becomes a simple matter to shift one way or the other to avoid interference from practically all of the old bents.

Having determined in this manner the location of the first new bent, it is easy to lay out all of the new bents to the proper spacing. The most difficult matter to adjust is usually the interference of some of the bents in the existing structure. There is seldom any reason, however, why any of the bents need to be more than one foot out of correct spacing at the ground line. With the usual bridge height of 20 ft. or more, the tops of the piles can readily be drawn over enough to fit the standard deck plan. It is not difficult to hold them in position by means of the horizontal X bracing in the plane of the caps.

In most cases the new structure will be slightly longer than the old bridge. This is desirable since it brings the ends of the bridge to a point of more stable support where the expense of maintaining the approach embankment will be less.

An accurate record of previous pile driving is very desirable as a guide, so that the suitable length of piling for each bent may be selected in advance, and a uniformly good penetration obtained throughout the new structure.

May Have to Pull Some Pile Stubs

By L. G. BYRD

Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

If the proper interest is taken in the work, not only the panel spacing but the pile spacing in the bents will be staked out before the driving is started. If this is done, all bents can be driven accurately to conform to any standard panel spacing. On the other hand, one will often meet with some difficulty in holding individual piles in line if the pile locations are not staked out before the driving is started. In order to do a good job of driving, it is sometimes necessary to pull an outside pile

Above—An Old Trestle Replaced by the One Below. The Old Bents Did Not Interfere With the New Ones

stub or drive the new piles inside or outside when the new panel spacing brings a bent to the same location as that of a former bent.

If the panel spacing has not been changed there should be no difficulty in making all panel lengths the same. It is always important, however, to lay out the job carefully on the ground and set stakes for every pile. This should be done by the supervisor personally, and the pile-driver foreman should understand that the piles are to be driven exactly where the stakes are set.

This question came up for discussion at a meeting which I attended about three years ago; several supervisors in attendance being in doubt as to the practicability of spacing all panels accurately. Since that time I have redriven and renewed both open and ballast-deck trestles ranging from 3 to 190 panels each, and aggregating a total of 564 panels or 6,890 ft. of trestle. Every bent in these bridges was accurately located for a panel spacing of 12 ft. for open deck structures and 13 ft. for ballast-deck trestles. The entire deck for each of these structures, including caps, stringers, ties and guard-rail

timbers, was preframed, using the same panel lengths that were used in staking out the bents. All holes were bored at the treating plant for bolts and track and line spikes. All timbers and bolt holes fitted so accurately that it was unnecessary to change the framing or ream or bore new holes in the field.

A marked saving can be made in the cost of erection where timbers are preframed, since most of the work of assembling can be done by unskilled labor. Furthermore, stringers can be purchased of the length desired, thus eliminating the waste that always occurs where the panel spacing varies somewhat from the standard. In addition, since the framing at the plant is done by machines it can be done at less cost than by hand.

Inlet and Outlet Pipes

What are the relative advantages and disadvantages of using a common pipe as the inlet and outlet for a service tank ?

Common Pipes Have Advantages

By Supervisor of Water Service

One of the advantages of a common pipe for use as both the outlet and the inlet of a service tank is that only one opening is necessary in the bottom of the tank, this being particularly desirable in the case of wooden tanks. One of the arguments advanced by those who favor an independent inlet pipe is that it can be erected to reach the top of the tank, thus insuring that the pumping head will be more nearly constant. Personally, I do not agree with this view point, since it is a waste of energy to pump continuously against the maximum head.

A common pipe with valves located just beyond the junction of the discharge line and the distributing system, permits either system to be isolated for repairs or other purposes without impairing the functions of the other. It is true that trouble between this junction and the tank may necessitate the cutting off of both systems and the draining of the tank, but this may also occur with independent pipes. A bypass beyond the valves will permit the water from the discharge line to go directly into the distributing system while the tank is drained and the valves closed.

Where a common pipe is used, only a single riser is necessary, thus simplifying the problem of insulation in cold climates. Furthermore, the circulation in the common pipe is approximately double that in each of two independent pipes, which reduces the probability of freezing, particularly if the storage water is kept warm.

A float valve cannot be used on a common pipe, but this should be no drawback, since a simple alarm system can be installed to notify the pumper that the tank is full. It is sometimes said that water hammer is communicated from one system to the other as a result of using a common pipe. I have never seen this happen. If the junction point is placed close to the tank, as it should be, the water in the tank will absorb much of the shock of the water hammer, thus minimizing its effect on the other system.

If it becomes necessary to use a float valve, as in the case of two tanks at different elevations which get their supply from the same source, independent inlets and outlets are required. The advantages of the common pipe are sufficient to warrant its use under almost all other conditions.

A Common Pipe Requires Precautions

By Engineer of Water Service

This is a question that at one time aroused considerable difference of opinion and that arose recently in connection with some tank installations which we made. One of the advantages of an independent inlet pipe which rises to the top of the tank is that the pumping head on the discharge side of the pump remains constant. Up to a certain point this is an advantage, particularly where centrifugal pumps are employed.

Where a common pipe is used, unless the connection is made close to the tank, any water hammer which occurs in either the discharge or the distributing system is at once communicated to the other, and may have serious consequences. A long discharge line may have a number of undiscovered leaks, particularly if it passes through wet or swampy ground. In this event, a common pipe increases the opportunity for a considerable loss of water through leakage.

Again, the eddies and currents that are set up, as the water enters the tank from the discharge line through a common pipe, have a tendency to stir up the sediment at the bottom of the tank. Considerable of this may get into the distributing system and eventually into the locomotive boilers. This may not be particularly important with clear waters or in conical-bottom tanks which are properly equipped for blowing out the sediment. In flat-bottom wooden tanks and standpipes, however, it may assume considerable importance with muddy waters.

It is obvious that a float valve cannot be used on a common pipe, so that other means must be employed to prevent the overflowing of the tank. For this reason a common pipe cannot be used where the discharge line serves two tanks which are at different elevations, or in a service tank that is fed from a higher tank.

While there are conditions under which a common pipe may be satisfactory, I am of the opinion that, in general, independent pipes for inlet and outlet purposes are more satisfactory. There are also situations where the inlet pipe should, by all means, be carried to the top of the tank.

Spacing Ties

What effect, if any, does the failure to space crossties uniformly have on track? Should the ties be spaced? If so, when should this be done? Should the track be worked merely to space the ties ?

Has Detrimental Effect on Gage

By R. L. SIMS

District Engineer Maintenance of Way, Chicago, Burlington & Quincy, Galesburg, Ill.

It is important, from the standpoint of track maintenance, that crossties be spaced uniformly. Track with irregular tie spacing is almost certain to be of irregular gage. It is extremely difficult, if not impracticable, to tamp the ties properly when smoothing track if the spacing is irregular, while the cost of making spot renewals of ties is always higher where the spacing is not uniform. All of these items except the last, have detrimental effects on the riding qualities of the track, particularly on high-speed lines.

Ties should always be spaced uniformly. Where this is done the rail has a more uniform bearing throughout its length and it is often possible to effect a saving in

the number of ties required per panel.

Spacing should be done whenever the general condition of the track requires out-of-face surfacing. The decision as to whether the track should be surfaced merely to obtain uniform tie spacing will depend entirely on the class of the line and the standard to which it is maintained. In any event each individual case deserves close study on the part of the maintenance officers in responsible charge of such work.

Impairs Track in Several Ways

By ROBERT WHITE
Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

Long experience has confirmed my belief that under all conditions crossties should be spaced uniformly. If they are not, the condition of the track will become impaired in several ways. Irregular spacing is nearly always accompanied by sluing of the ties, which tightens the gage, causes unnecessary wear on the rail and either loosens or throat-cuts the spikes, or both. If the spacing is extra wide, the rail may become surface bent in warm weather or it may break at low temperatures.

Crossties should be spaced if the spacing is not uniform. Where tie renewals are heavy, section foremen can do much of this work while making these renewals. The best time to do the spacing, however, is when the track is being given a general raise. If the spacing is very irregular and extends over a considerable distance, I believe that the advantages of uniform spacing are sufficient to justify working the track for the sole purpose of attaining this condition.

Has More Effect Than Is Often Realized

By BURT HURST
Section Foreman, Missouri Pacific, Alma, Ark.

Failure to space crossties has a more detrimental effect on the condition of the track than any other single factor, assuming that roadbed and ballast conditions are satisfactory. The track cannot be kept in line, gage or surface. Irregular spacing nearly always causes pumping ties, thus affecting the ballast drainage. Joint ties, particularly, should be spaced properly, and they should be kept spaced, regardless of conditions under the remainder of the rail. There are times when spacing must be done where it is impracticable to give the track a general raise, because of weather conditions or insufficient forces. At these times two men can straighten up and space a surprisingly large number of ties. To do this they should be provided with a tie spacer. In the absence of this equipment a bar and two blocks 4 in. by 4 in. by 6 in. can be used to advantage.

I have found that a simple and effective method of marking the rail for spacing is to lay off the centers on one rail and use a track gage to get the center on the opposite rail. One experienced man can keep ahead of a gang of 25 men in this manner.

Next in Importance to Proper Tamping

By W. R. GARRETT
Yard Foreman, Chicago, Burlington & Quincy, Pacific Junction, Ia.

Aside from proper tamping, uniform spacing of the crossties is the most important factor in maintaining good surface. Where the spacing is irregular, the track has a tendency to settle unevenly and always rides rough. Any panel in which the spacing is decidedly irregular will get out of line more quickly and farther than panels in which the spacing is uniform.

Ties that are spaced uniformly offer more resistance, with much less variation, to the lateral forces that are imposed by the moving equipment, assuming that the ballast shoulder is also uniform and of proper width. In my opinion, there are no exceptions to the rule that ties should be spaced uniformly. Spacing should always be done when the track is being given a general raise, but many irregularities of spacing can be corrected economically during the period of tie renewals.

In general, it is not economical to work the track merely to space the ties. If the spacing is very irregular, it might be desirable to do so, but the track should be raised as a part of the operation since, otherwise, it would be difficult, if not impracticable, to leave the track in good riding condition. Wherever general spacing is done, there is always some rough track until the ties are properly bedded.

Irregular Spacing Causes Irregular Surface

By W. RAMBO
Roadmaster, Missouri Pacific, St. Louis, Mo.

Observation indicates quite clearly that failure to space crossties uniformly causes irregular surface, irregular gage and poor line, and that the track will invariably ride choppy. By all means, crossties should always be spaced uniformly. This should be done immediately after new rail has been laid and in connection with the surfacing and reballasting, at which time the track is given an out-of-face raise. If the ties are spaced uniformly and an adequate number of anti-creepers are applied to hold the rail, there are few cases where the ties will not remain spaced with sufficient uniformity until the condition of the track again demands general surfacing.

Track should never be worked merely to space the ties. If the spacing has been neglected until the lack of uniformity is so great as to demand respacing, it is quite probable that general surfacing will also be needed. If a proper job of spacing has been done in the first instance and maintenance is given the proper attention there are no conditions with which I am familiar which will require respacing before the track must again be raised out of face.

There is another phase to this subject which is only partly implied in the question. Ties should never be spaced unless the track is given a general raise. Any attempt to space crossties without raising the track is certain to result in an uneven bearing of the ties in the ballast, which in turn causes irregular surface and uneven cross level.

Believes in Uniform Spacing

By J. J. HESS
General Roadmaster, Great Northern, Seattle, Wash.

In my opinion, all ties should be spaced uniformly. It is well established that it is detrimental to give a special spacing to the joint ties and slot-spike the joints. A far better method, from the standpoint of track maintenance as well as from that of the riding qualities of the track, is to space all ties an equal distance apart center to center and allow the joints to come where they will, hitting or missing the ties as may be.

Enough tie plates should be provided to insure proper bearing for all joints. These plates should be so designed that the spiking will be done on the outside of the angle bar and not in the slots. Where this practice is in vogue, the angle bars need not be slotted. A sufficient number of anti-creepers should be applied to eliminate rail move-

ment. This will relieve materially the lateral stresses in rail joints and will aid in reducing the tendency of the joints to get out of line and gage. Anti-creepers and the method of spiking which has been mentioned combine to reduce the sluing of joint ties, the cutting and bending of the spikes at the joints and the resulting damage to the ties which support the joints. Uniform spacing without reference to the location of the joints results in a large saving in labor and time when making rail renewals, since it is unnecessary to respace the ties to conform to the new locations of the joints. Furthermore, later maintenance is improved and is less expensive by reason of the fact that it is not necessary to remove the ties from their old beds.

After ties have once been spaced uniformly, it should not be necessary to respace them again, providing the renewals are made with ties of comparable dimensions, until the condition of the track demands an out-of-face raise. At this time such spacing as is necessary can be done at a minimum expense. In other words, if the spacing is done properly in the first instance, the irregularities which always creep in should not be of sufficient magnitude to require respacing until it is necessary to give the track a general overhauling.

Removing Snow and Ice

What practical methods can be used to remove snow and ice that interfere with the laying of rail in the winter ?

Finds Weed Burners Effective

By J. J. HESS

General Roadmaster, Great Northern, Seattle, Wash.

In times past, one of the serious difficulties encountered in laying rail in winter was the removal of snow and ice which interfered with the work and prevented us from obtaining an even bearing for the rail and tie plate. Of late, however, we have used weed burners in this service and have found them quite effective.

Can Use Either Steam or Weed Burners

By Division Engineer

When we first began to lay rail in the winter we experienced much trouble with snow and ice, particularly the latter. The loose snow could generally be swept away, although considerable labor was required to do so and we often found that it was not removed as completely as it should have been. Brooms had no effect on the ice and tightly packed and frozen snow, and attempts to remove them by chopping with axes, adzes, shovels or other tools did not prove satisfactory, besides which it consumed much labor.

Our next move was to fit a locomotive with steam connections and bring the steam to the rear of the tender. Here, by means of suitable pipes and steam nozzles, which were formed by flattening the ends of the pipes, we were able to blow the snow away, leaving the ties clean for about six inches on each side of the rail. Under ordinary conditions, a good job could be done while the locomotive was moving at four to six miles an hour, depending on the amount of snow and the length of time it had remained on the track. If it was deep and well packed, the rate of progress was less.

Ice and snow that was packed in the flanges and frozen required a little more time, but there was no particular difficulty, even under the worst conditions in keeping well ahead of the rail gang. It had been our expectation that the melted snow and ice would form enough water to be troublesome. We found very soon, however, that the force of the steam was sufficient to blow the snow away before it had a chance to melt. Likewise, all of the water from the melting ice and such of the frozen snow as was not blown away, as well as the moisture from the steam which condensed on the cold rail, was blown away, leaving the ties and rail clean and dry.

The only drawbacks to this method were the necessity of fitting up the locomotive, the fact that it could not be used in other service without the partial removal of the steam lines and the further fact that if it was required in other service we were left temporarily without means of removing the snow and ice effectively. The cloud of steam which was an inherent part of the blowing operation did not interfere with the work of the rail gang, but it did cut off the view of trains approaching on the other track.

It occurred to us recently that weed burners might be suitable for melting the snow and ice from around the rail. We found that we could clear a wider space with this equipment than was practicable with the steam. This can be done without damage to the ties or danger of setting them afire if the operator is alert and does not remain too long in one place. As long as there is snow or ice to melt, there is sufficient moisture to protect the ties.

If properly handled, this method gives as clean and dry a surface as the steam. It has the additional advantage that no equipment is taken from revenue service, while the machine is always available when needed. Furthermore, there is no cloud of steam to hide the view and very little noise.

Freight-House Doors

What are the relative advantages and disadvantages of the various types of doors for freight-house service ?

Each Type Has Special Advantages

By Engineer of Buildings

With the multiplicity of types of doors and the large number of variations in these types which are available for freight-house use, the building designer has a wide range of choice through which he can meet almost every requirement as to space, light, facility of operation, fire risk and property protection.

Horizontal-sliding doors are the simplest in both design and operation and can be installed and maintained more cheaply than any other type. They have a disadvantage not encountered in any of the other types in that they require considerable wall space between the door openings, which eliminates them from consideration where tail-board space is at a premium.

Vertical lift doors are simple in design and operation, standing next in rank to horizontal-sliding doors in low cost of installation and maintenance. This type includes the double-section counterbalanced door. Like the horizontal-sliding type they occupy little floor space. Double counterbalanced doors require considerable maintenance. Doors of the vertical bifold or jack-knife type require little space at the sides for hanging, but since they swing

back into the room as they open, they require considerable floor space for their operation. They have given good satisfaction in many installations.

Turnover doors also require little space at the sides, but they also project well into the room while they are being opened or closed. For this reason these latter two types are better suited for outbound freight houses than for inbound houses or warehouses where storage space may have a high value.

All of these types can be fitted with glass panels to improve the natural lighting of the freight room when they are closed. All except the first require some form of counterbalancing, so that special care must be given to the counterbalancing mechanism to avoid the probability of accidents as a result of broken counterbalance chains or cables. All of these types can be of wood or metal construction as desired.

Rolling doors of interlocking metal slats or sheets are adapted particularly for use where the openings are large and the service severe. The corrugated sheet doors are less expensive but of lighter construction than the slat doors and do not withstand severe service as well. In selecting doors of this type, special attention should be given to the operating mechanism, since a poorly designed mechanism may result in a complete failure of the doors. Doors of this type require the least space for their installation, since they can be hung continuously with only a 10-in. post between openings. It is not possible to install windows in rolling doors.

Every House Presents Special Problems

By Assistant Engineer for Buildings

This is a question that should arouse a wide difference of opinion, each of which is supported by fact, since every freight house presents special problems of door application. A certain type of door which may be well adapted for one house may not be satisfactory in another. Conditions of design and operation must be studied for individual houses and the type of door selected which will best meet the requirements.

Let us first consider wood versus metal doors. Fireproof construction calls for metal or metal-sheathed doors. Either wood or metal is satisfactory for ordinary construction. Wooden doors are rigid and will stand much abuse, while they are easily repaired. Steel doors are neat and fireproof, but will not stand much abuse such as is common in freight-house operation, while major repairs cannot be made by the regular maintenance forces.

As to types of design: The jack-knife type has been much used in the past and has given excellent satisfaction. It occupies no floor space and little wall space, and it is equipped with substantial hardware. It is an excellent door and is still popular.

The turnover type has come onto the market in recent years and has proved to be quite satisfactory. It occupies no floor space and little wall space and, when open, lies along the ceiling, completely out of the way. The counterbalances are actuated by a spring arrangement which gives little trouble.

The sliding door has the least mechanical apparatus to get out of order and is of a type that maintenance men understand thoroughly. It occupies little floor space, but its use is limited to those situations where continuous tail-board space is not required. This type is probably used to a greater extent than any other.

The vertical-lift type has become popular in recent years, particularly where metal doors are required. A single leaf is preferable to the double-leaf arrangement, but with either, considerable head room is necessary. It is essential that provision be made for the protection of workmen against falling counterweights, if the chain or cable attachments should break.

Rolling steel or wood slat doors are adapted particularly for use when large openings are required, but are seldom used in the smaller freight houses. The automatic design of this type has a much wider application, however, as it affords excellent protection as a fire door.

Cinder Ballast

Where locomotive cinders are used for ballasting main tracks, what depth is most economical? How wide a ballast shoulder should be provided ?

Should Not Be Used on Important Lines

By W. R. GARRETT

Yard Foreman, Chicago, Burlington & Quincy, Pacific Junction, Ia.

Locomotive cinders make a very poor ballast for main tracks over which either heavy or high-speed traffic moves. For this reason I do not consider it economical to use cinders for ballast on important main-line tracks. They are well adapted for use on branch lines, however, where the traffic is lighter and high-speed trains are not operated.

While the total depth of the ballast will necessarily vary with the character of the roadbed and the amount of ballast that has been applied previously, my experience indicates that it is not good practice to use a depth greater than four inches in making a new application of cinder ballast. The reason for this is that the loose character of the material causes it to settle considerably under traffic if a greater depth is used, and the surface becomes quite uneven in a short time. Four inches of cinders can be well compacted, however, in tamping and up to this depth a good surface can be held.

A shoulder not less than six inches wide should be used, and the slope should be relatively flat, if the width of the roadbed permits. Drainage is an important factor in the use of locomotive cinders. Owing to their porosity water passes through them readily. If the roadbed is not well drained, water that is held on its surface rises into the ballast and quickly causes pumping joints.

Would Use a Very Wide Shoulder

By HENRY BECKER

Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

While I have never used locomotive cinders on important main-line tracks which had not been ballasted previously, I have used them to advantage for the purpose of improving conditions at soft spots. In such instances it has been my experience that a depth of four to six inches is ample. They have several advantages, in that a good surface can be held with much less work than is possible with any other type of ballast with which I am familiar. Because of their porosity water passes through them quickly and it is possible to surface the track under conditions which would be impracticable with other forms of ballast.

Furthermore, they constitute the cheapest material that can be obtained for ballast purposes, since they are a waste product that it would otherwise be necessary to dispose of without productive results. In wet or soft places, the shoulder should be made very wide for two

reasons. It is always difficult to hold the track in line so that a shoulder wider than the standard is desirable. As soft track requires more attention, a reserve supply of ballast is needed, so that the necessary surfacing can be done whenever required. To insure that this supply will be ample and to avoid frequent shipments of ballast, it has been my custom to provide a shoulder about four feet wide on each side of the track, from which the needed material can be taken for raising the track.

Depends on Character of Roadbed

By J. J. HESS
General Roadmaster, Great Northern, Seattle, Wash.

I have always considered that under the best conditions there should be a minimum of six inches of ballast under the ties where cinders are used for ballasting main tracks. Under ordinary conditions this should be increased to about 10 in., while even more may be required under adverse conditions. It should be understood, however, that the proper depth depends on the character of the material in the roadbed and the manner in which it is drained.

The shoulder should be kept at the level of the tops of the ties and should be about 12 or 14 in. wide. The slope of the ballast shoulder should be 1½:1, although this will be governed by the width of the subgrade.

Inspecting Turntables

What provision, if any, can be made to facilitate the inspection and repair of the end trucks of turntables ?

Wide Deep Recess Facilitates Work

By General Bridge Inspector

The road with which I am connected makes the local bridge and building forces responsible for the condition of the turntables on their respective divisions. For many years it was necessary to take a turntable out of service while the end trucks were being inspected or repaired, because it had to be jacked up high enough to give access to these parts. This made both inspection and repairs costly, since the repair forces often had to wait for long periods, despite definite arrangements as to the time the table was to be turned over to them, to permit the turning of locomotives that came in or were ordered out unexpectedly.

To reduce the cost of inspection and maintenance, to shorten the time the turntable is out of service and to simplify the operations of inspection and repair, we provided a recess at one point in the circle wall of a few of our turntables. This proved a decided help, since the parts can be observed without the necessity of using jacks and a large amount of blocking. It also became unnecessary to take the turntable out of service for inspection purposes. An added advantage is that the parts can be inspected while in working position and, if desirable, a locomotive can be run back and forth over the turntable during the inspection.

The first of these pits were too small, however, and later ones were increased in height, depth and width. This was a still further improvement, since two or three men can get into them and yet have elbow room. As a further step, we are now placing two of these recesses diametrically opposite each other whenever we install a new turntable. In this way, both ends can be inspected or repaired at the same time, still further reducing the time of interference with the operation of the turntable.

It was formerly necessary to keep a turntable out of service for several hours while it was being jacked up, inspected and lowered, after which the pit had to be cleared of the jacks and blocking. In addition, the gang often lost a greater amount of time while waiting for an opportunity to do the work. Now we simply find out when the slack period in its operation will occur, make our plans accordingly and do not take the table out of service. While it is not always practicable to make repairs to the end trucks without taking the turntable out of service, the required material can be assembled in the recesses and the application can be made in a relatively short time.

Provide a Recess in the Circle Wall

By F. H. CRAMER
Assistant Engineer of Bridges, Chicago, Burlington & Quincy, Chicago

Inspection of and repairs to the end trucks of turntables are required at frequent intervals if they are to be maintained in the best possible condition. This is particularly true at important engine terminals where a large number of locomotives must be turned daily.

To make proper inspections and to facilitate the repairs when needed, a small pit or recess can be installed in and back of the circle wall, in a space not occupied by tracks. If sufficient clear space is not available for this purpose, the pit can be built under a track that is not used extensively.

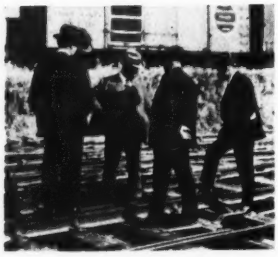
Formerly, the usual practice was to provide the same size of recess for all sizes of turntables. Recently, however, it has been found to be better practice and more economical to install a larger recess, of sufficient size to permit two or three men to work with ease and handle the parts during inspection or repair. Where conditions will permit, it is also good practice to construct the inspection pit with a removable roof. This avoids the necessity of compelling the inspectors or repair men to remain in a cramped or stooping position while at work. It also provides much better lighting. By allowing plenty of room and freedom of movement the work can be done more quickly and economically.

An important feature which reduces the cost of repairs, lightens the work of the repairmen and facilitates the removal or replacement of the truck parts, is to make the circle-rail foundation as narrow as practicable at the working pit. By doing this, greater clearance is provided, so that it is possible to drop the wheels out of the box-type and carriage with a minimum amount of jacking to raise the end of the table.

A small platform placed at the proper location between the turntable girders will also add to the facility with which the inspection is made. By using such a platform the inspector is afforded a better chance of seeing how the end carriage wheels, the boxings and the trucks behave while they are in motion under load.

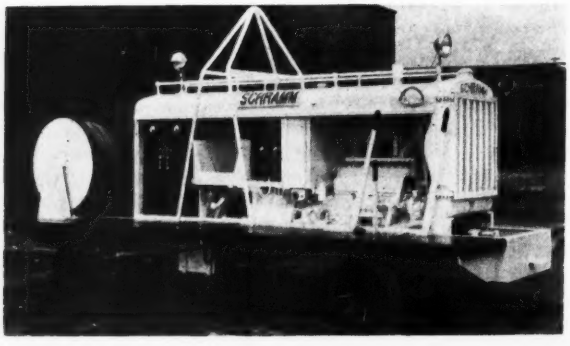
An Old Station—Fifty years ago, when it was first opened, the Pennsylvania's Broad Street Station in Philadelphia was the largest and most imposing railroad terminal building in America. Now its accommodations are scarcely as large as those afforded by the new suburban station recently opened on Sixteenth street, and they are quite unimpressive in comparison with the accommodations which will be provided in the new station at Thirtieth street when it is completed. During the fifty years of its existence, the Broad Street station has accommodated more than 500,000,000 passengers.

NEW *and* IMPROVED DEVICES



A Car-Mounted Welding Generator

A NEW rail-car-mounted electric welding outfit, designed for use in the various classes of track and bridge welding, including the building up of battered rail ends and frog and crossing points, and also the repair and strengthening of bridge members, has been put on the market by Schramm, Inc., West Chester, Pa. This outfit consists essentially of a six-cylinder Buda gasoline engine driving unit, which has a rated horsepower of 50 at the welding speed of 1440 r.p.m.; a 300-ampere welding generator with direct drive from the engine; a 5½-kw., 110-volt auxiliary generator, which is connected to the engine through a flexible coupling; power switchboards, a rheostat and other auxiliary electric equipment; and two cable reels, mounted on ball bearings. The



The New Schramm Welding Generator

engine is equipped with a self-starter and with the Schramm standard slow-down, which slows down the engine to idling speed when the welding arc is broken, and causes it to maintain a predetermined speed while welding is actually in progress.

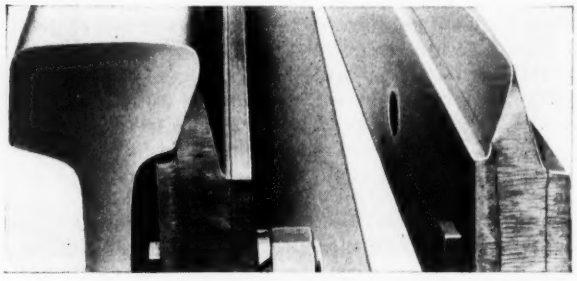
All of the equipment is mounted compactly on a steel frame rail car, which is self-propelled from the engine through a power take-off, and the power plant and all of the electrical equipment are housed under a large steel hood with sliding doors on both sides. The cable reels are mounted on the rear of the car platform, one being fitted with 1,000 ft. of cable to carry the welding current, and the other with 1,000 ft. of Duplex wire for carrying current to grinding units. Both the welding cable and the auxiliary power line are furnished with terminals or outlet plugs at intervals of 250 ft. to facilitate the work at different distances from the generator unit.

The car itself, which can be operated at a speed of 20 m.p.h. in either direction, is equipped with four-wheel brakes, a drawbar connection for attaching wheel-mounted grinding equipment, transverse derailing wheels and a lifting bale. Other equipment on the car includes running boards on both sides, suitable hand rails, and two floodlights, one at each end. Complete with cable, it has a shipping weight of about 8,000 lb.

Long Life Embodied in New Racor-Samson Switches

ADOPTING a principle of switch point construction which has become a universal standard on many roads in continental Europe after a number of years of experiment and use, the Ramapo Ajax Corporation, New York, has put on the market a new type of switch point, which is designed to overcome the principal deficiencies and the short life of the standard knife-blade type of point now in use. The outstanding feature of the new point, which is known as the Racor-Samson switch point, is that it has a wide tapering head, which results in its being sturdier and of greater life than a thinner point made of the same class of material.

In contrast with a standard point, the head of the Racor-Samson point, at and adjacent to the tip end of the point, is in the shape of an inverted "V," several



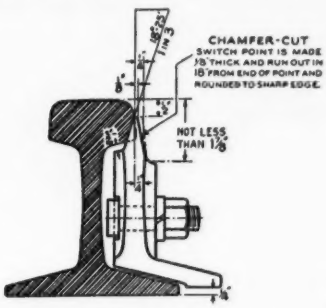
End View of the Racor-Samson Switch Point, Showing Its Shape as Well as the Machined Stock Rail Used With It

times as thick at the base of the V, or the head, as a standard point. Furthermore, the increased cross section of the point continues back throughout that portion of the point which comes in contact with the stock rail.

The thicker section of the new point, as compared with a standard point, is made possible by the provision of a housing on the underside of the gage side of the head of each stock rail, to make room for the added material in the points. This housing is formed by planing metal from the lower side of the head of each rail in direct proportion to the increased thickness of the point, which gives the planed side of the head of the stock rail an appearance more or less similar to the head of a

"Head-free" rail. As a result of this construction, all of the advantages of a heavy section, particularly at the tip of the point, are gained without encroaching on the gage line or without deviation from the standard contact area presented to wheel treads and flanges. Also, the standard stock-rail gage lines are preserved throughout their length.

As the end of the Samson point receives lateral wear, the stock rail housing protects it from full flange contact and, therefore, from the normal abuse and wear to which worn standard points are subject. As a result of this feature of construction, it is said that the Samson switch point is safer than a standard point, especially in that it can not be worn wafer thin and thereby become subject to breakage, or caused to present a jagged wearing surface, which condition has been the cause of derailments. It is also said that in actual service, a Samson point has given up to 10 times the life of the common knife-blade type of point, without approaching a sufficiently worn condition to make it hazardous.



End View of the New Racor-Samson Switch Point

Section Through the Point at Center Line of Switch Rod No. 1

Section Through the Point Near Point of Separation of the Rail Heads

It is also claimed that the life of the Samson stock rail is increased in proportion to the increased life of the Samson switch point, and that since it is usually desirable and economical to renew stock rails at the same time that points are renewed, the expense for stock rail renewals with the Samson switch is many times less than that of stock rail renewals with the ordinary type of switch installation. Another economy available through the new type of switch points is that it does not require the use of a switch-point protector.

The only additional expense in installing Samson switch points is that incurred in providing the machined stock rails furnished with the points. This added cost is said to amount to only about five per cent of the cost of the standard knife-blade switch. In other words, the switch points and the switch plates, rods and fittings in a Samson switch installation cost no more than these same parts in the present standard design of switch.

While the shape of the Samson point appears to differ considerably from the standard design of points, the difference is entirely on the stock rail side, since the planing on the gage side is in accordance with A. R. E. A. standards unless otherwise specified. While the machining of the stock rails gives them the appearance of Head-free rail on one side, the machined planes of the heads of these rails are more nearly vertical than the chamfered faces of Head-free rail. For this reason, it is necessary that stock rails be machined for use with Samson switch points in Head-free rail territory as well as in territory laid with the usual full-head section rail.

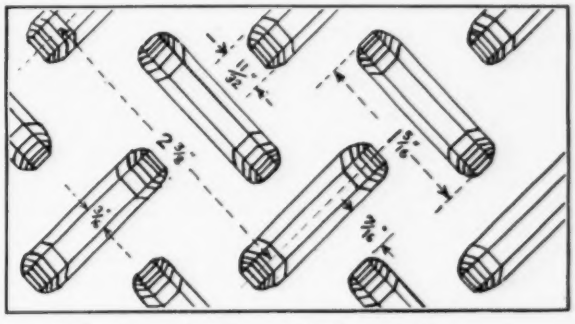
The stock rails can be machined for their entire length if desired, except for the joint bar portion at each end, but for locations where a large percentage of heavy traffic is trailing off the turnout points, it is said that it is desirable to have the full-head section of the stock rails closely in advance of the trailing points. Ordinarily, the length of the machined portion of the stock rails is only slightly longer than the contact length of the switch points against these rails. This makes it desirable that the location of joints in advance of the switch points, and also the length of stock rails, be uniform so that machined stock rails carried in stock will fit in any Samson switch installation.

To prevent the creeping of the rails, standard heel blocks can be used at the heel of the switch, or, if the floating heel joint is preferred, heel blocks may be installed back of the heel joints, bolting the lead rails to the stock rails, or the stock rails can be equipped with some of the other effective means of preventing creeping.

While the Samson switch points are covered by United States patents and are manufactured and sold by the Ramapo Ajax Corporation, they can also be furnished under license by most of the other companies specializing in trackwork.

A Floor Plate of New Design

THE Inland Steel Company, Chicago, has developed a new type of floor plate, which is known as the 4-Way floor plate and which is applicable to freight and passenger station platforms and other places where there is need for a non-skid flooring. The pattern of the new plate consists of short lineal projections about ⅛ in. high and arranged alternately at right angles to each other. This pattern is said to weigh less per square foot without loss of strength, owing to the fact that there is less metal in the projections. Because of the alternate arrangement of the projections, the new floor plate presents a non-skid surface, regardless of the direction of traffic, and individual plates can be laid in any relation to each other without altering the design. It is also said that this pattern assures efficient drainage and easy sweeping.

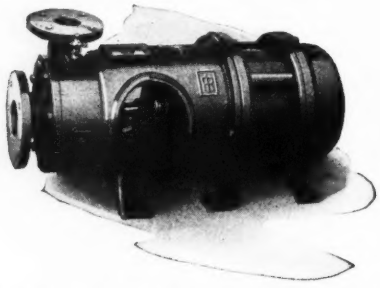


Showing the Pattern of the New Floor Plate

Small Capacity, Light Weight Centrifugal Pumps

A NUMBER of new sizes have been added to the Cameron line of general service centrifugal, motor-operated pumps manufactured by the Ingersoll-Rand Company, New York City, so that these pumps are now made with discharge openings of one inch and upward. The pumps, which are self-contained compact, portable units, are of the single-stage, single-suction, enclosed-impeller type, with a built-in electric motor drive. They have only two bearings, and these are of the ball type, which require lubrication only once a year. There is only one stuffing box, which is easily accessible, and the impeller is made of bronze and is hydraulically balanced. Other features are renewable bronze wearing rings and shaft sleeve, and the fact that the discharge nozzle may be turned to any one of four positions.

The pumps are designed for use against moderate heads in a wide variety of service, such as circulation



One of the Smallest Cameron Motor-Pump Units

systems, air conditioning equipment, small water supply systems, condensation return systems, and in general transfer service handling a wide range of liquids. They can be obtained with various motor combinations for all ordinary current conditions and specially equipped for use where ordinary motor operation is hazardous.

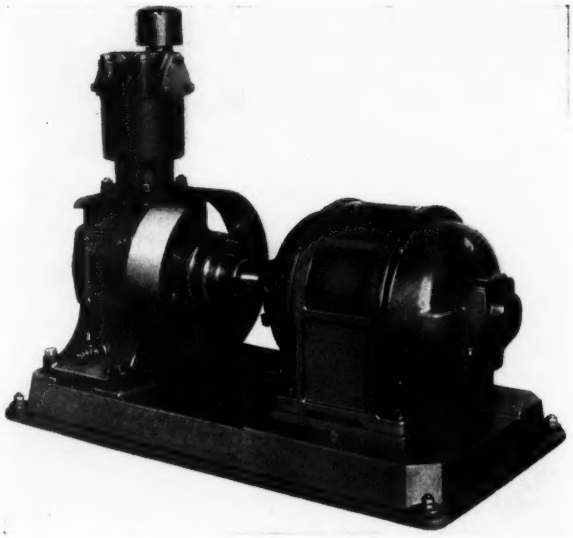
New Sullivan Air Compressors

THE Sullivan Machinery Company, Chicago, has added a number of new designs to its line of vertical single-acting compressors, which are known as Models WL-1, WL-11, WL-2 and WL-4.

WL-1, which is belt or V-belt driven, and WL-11, which is direct driven by a motor, are single-cylinder, single-acting units which provide piston displacements ranging from 27 to 87 cu. ft. of free air per minute and are designed for pressures up to 125 lb. per square inch. These units are said to be distinguished by their compactness, simplicity and substantial construction. The crank shafts are mounted on heavy-duty ball bearings, while the cylinders are cast separately and bolted to the frames, as a means of permitting economical reboring or replacement when necessary. The cylinder heads, which contain the inlet and discharge valves, may be attached in any one of four horizontal positions.

In those units that are direct-connected to driving motors, flexible external and internal gear couplings are employed between the compressor flywheel and the motor shaft. The unloading system is of the Sullivan "sweep control" type, and automatic regulation of several types may be had, including manual, semi-automatic and automatic start and stop control for both units.

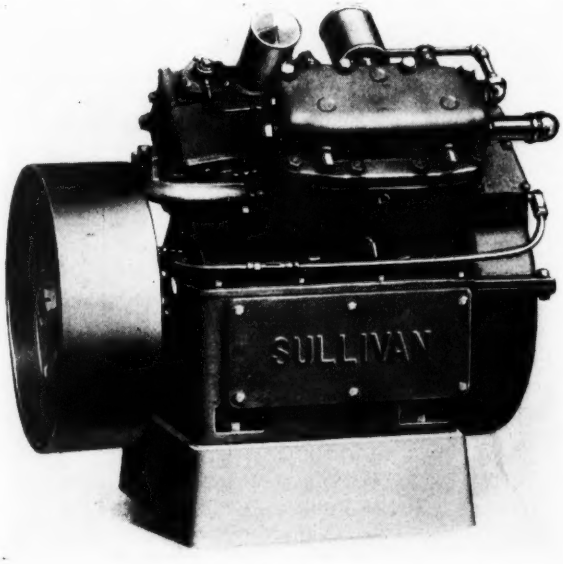
Models WL-2 and WL-4, which are belt-driven verti-



The WL-11 Vertical Direct-Connected Compressor

cal units, are available in two-cylinder and four-cylinder models, respectively, and are similar to direct connected units already available. These units may be driven also by V belts from any desirable form of power unit, and in such cases the compressor, motor and V-belt drive are mounted on a sub-base. The capacities of these models range from 119 to 348 cu. ft. of free air per minute.

The four-cylinder units are of the V-type balanced design, the two pairs of cylinders being set at an angle of 90 deg. with a common crank shaft and two cranks. Such an arrangement contributes to compactness and



The WL-4 V-Type Belt-Driven Compressor

is said to provide an important factor of balance. The use of four small cylinders instead of two large ones permits the use of reciprocating parts which are said to weigh only one-third as much as the same parts would weigh in a two-cylinder unit of equivalent capacity.

In addition to "sweep control" unloading, these models have in common with those previously mentioned Sullivan "wafer" valves, water-cooled cylinders and heads and automatic lubrication.

News of the Month . . .

Porter Elected Chairman of I. C. C.

Pursuant to the policy of the various members serving as chairman in rotation, the Interstate Commerce Commission has elected Commissioner C. R. Porter, as its presiding officer for the year 1932, to succeed Ezra Brainard, Jr.

Commissioner Eastman Comments on Regulation and Competition

Less competition within the railroad industry itself and more co-operation on the part of railroad managements was urged by Commissioner Joseph B. Eastman of the Interstate Commerce Commission in an address before the American Economic Association at Washington recently. Referring to the argument that the railroad industry has changed from a monopolistic to a competitive industry and that it may be well, therefore, to relieve the railroads in larger measure from the burden of public regulation, he said that a recent examination into the matter, led him to say without hesitation that public regulation has always been directed quite as much against evils resulting from competition as against those resulting from monopoly. In line with this thought, he was of the opinion that a modest beginning could be made in the regulation of interstate motor transportation and that it seemed not unlikely that water carriers themselves will ask for public regulation of their rates as a protection against rate wars and destructive competition. He also said that some changes in the laws may be desirable to permit freer use by railroads of motor trucks and buses as auxiliaries.

Gov. Roosevelt of New York Urges Higher Taxes on Trucks

Higher taxation of heavy buses and trucks operating on the state highways, was urged by Governor Franklin D. Roosevelt of New York in his message to the legislature on January 6, in which he promised to make specific recommendations in this connection in his budget measure. "For many generations" said Governor Roosevelt, "the greatest of common carriers, the railroads, have formed the background of that form of wealth which makes stable investments. Banks, insurance companies, charities, hospitals, churches, trust funds, all, rightly or wrongly, have placed their confidence in the permanence of the underlying mortgages of the railroads. Many people have seen the serious affects of a nation-wide depression on railroad traffic. The railroads are heavy sufferers, in addition, from a new competition by great trucks and buses operating on highways built by the state. In view of the fact that the taxes paid by the railroads have helped and are helping to build these highways and that the trucks and buses now use them almost tax-free, a better equalization of taxes is called for in all fairness. I shall ask in my budget for a tax on heavy motor vehicles commensurate with their use of the highways of the state."

First Quarter Carloadings to Be 6.6 Per Cent Lower

Shippers of the country, through estimates submitted to the shippers' regional advisory boards, anticipate that carload shipments of the 29 principal commodities in the first quarter of 1932 will be approximately 5,241,746 cars, a reduction of 370,415 cars, or 6.6 per cent below the corresponding period of 1931. Decreases in carloadings, ranging from 2.1 per cent to 18.1 per cent, are expected to take place in 12 of the 13 regions, while in the Southwest region an increase in carloadings of 0.4 per cent as compared with last year, is anticipated.

Railroad Buying Still Large

In spite of the profound influence of the current business conditions on railway purchases in 1931, preliminary figures compiled by the Railway Age indicate that the total purchases of materials, supplies, fuel and equipment of Class I railroads during the year totaled $863,000,000, an average expenditure of more than $72,000,000 a month. Direct purchases for the year, excluding those for equipment, included $224,200,000 for fuel, $50,800,000 for rail, $59,700,000 for ties and $360,000,000 for miscellaneous items. It is pointed out that a significant feature of railway purchases in 1931, one which attracts attention particularly from the standpoint of its bearing on their future purchases in the markets of the country, is the fact that purchases were only 16.8 per cent of operating revenues, as compared with 20.1 per cent in 1930, 21.8 per cent in 1929, 20.8 per cent in 1928 and 22.8 per cent in 1927. This condition supports the contention that railway buying was less in 1931 than it should have been to maintain the properties adequately.

Reconstruction Finance Corporation to Aid Railroads

The bill creating the $2,000,000,000 Reconstruction Finance Corporation for the purpose of expanding commercial credit in this country, which has been passed by both houses of Congress and signed by President Hoover, contains provisions providing for the loaning of funds to railroads engaged in interstate commerce. Such loans will be made available when, in the opinion of the board of directors of the corporation, the railroads applying for them are unable to obtain necessary funds upon reasonable terms through banking channels or from the general public. In reporting the bill the Senate committee on banking and currency pointed out that "the railroads are in an extremely embarrassing predicament, owing to the abnormal falling off of traffic which has affected their revenues so seriously during the past two years, and to their difficulties in borrowing." The committee reported further that "it is becoming increasingly difficult to market the bonds of even the best railroads and the market price of railroad bonds in general is becoming so depressed that the financial institutions holding this class of paper are unable to realize on them."

Supreme Court Sets Aside I. C. C. Grain Rate Order

On January 4, the Supreme Court of the United States handed down a decision setting aside the order of the Interstate Commerce Commission making a general downward revision of grain rates in the Western district, which went into effect on August 1, 1931. The western railroads had taken the case to the Supreme Court on appeal from a decision of a federal district court at Chicago refusing the roads an injunction restraining the commission from putting the lower rates into effect. The Supreme Court ordered the case remanded to the lower court with directions to grant the

injunction. The decision of the Supreme Court was based on the fact that the commission had denied an application of the railroads for a rehearing of the case in the face of economic conditions that did not exist in 1928, when the record of the case was closed.

Delaware & Hudson Subdivision Wins State Safety Campaign

Entering as a unit by itself, Subdivision E of the maintenance of way department of the Delaware & Hudson, of which Oscar Surprenant, Schenectady, N. Y., is roadmaster, won a group prize in the Seventh Annual State-Wide Accident Prevention campaign, sponsored by the Associated Industries of New York State, Inc. The campaign, which extended over 13 weeks, from August 30, 1931, to November 28, inclusive, provided for the division of the contesting industries into groups according to the nature of the accident hazards in each industry. Subdivision E of the D. & H., with 13 other industries was classified under Group N—construction, repairing and maintenance, including excavating and dredging, clearing, grading and roadmaking, railroad construction and paving. The prize awarded to subdivision E was a metal plaque, suitably engraved to indicate its meaning and the recipient thereof.

Mr. Surprenant with the Plaque Awarded His Subdivision

Report to I. C. C. Urges Regulation of Highway Carriers

Federal regulation of both freight and passenger highway transportation service is recommended in a report which Leo J. Flynn, attorney-examiner of the Interstate Commerce Commission, has submitted to the commission on that bodies' investigation of the co-ordination of motor transportation. The report, which includes comprehensive recommendations for legislation authorizing railroads to engage in motor transportation by highway, is summarized in a statement of 50 conclusions. The first of these asserts that "the national transportation machine cannot function with progressive efficiency, part regulated, part unregulated" and that "co-ordination of transportation agencies cannot reach its economic possibilities under this anomalous condition." Another conclusion recommends that legislation should be passed requiring that common carriers by highway must, as prerequisites to operation, obtain a certificate of public convenience and necessity and provide liability insurance or indemnity bond or satisfactory financial responsibility that will assure adequate protection for the responsibility assumed. It is also recommended that the hours of service, working conditions, training and wages of employees engaged in interstate motor transport service should be placed on a basis substantially similar to those of railroad employees and that railroad employees displaced from service by reason of the substitution of highway for rail service should be transferred to the motor-vehicle service of the railroad.

Reduce Rates on Citrus Fruits to Meet Truck Competition

The growing severity of truck competition in the transportation of citrus fruits from Florida to points throughout southern territory has forced the railroads affected to lower their rates on these products 25 per cent for an experimental period, expiring June 15. The rates were authorized by the Interstate Commerce Commission on January 9, to go into effect on 15 days' notice. The railroads also asked authority to make the same reductions to New York, Boston, Philadelphia, Baltimore and Washington, but the commission ruled that these rates must wait the usual 30 days' notice before going into effect. It was stated to the commission that during the present season, prior to December 9, 513,000 boxes of citrus fruits, the equivalent of 1,425 carloads, had been moved from Florida by truck.

Air Lines Reduce Rates

As a stimulus to travel by air, a number of air transport companies have reduced their passenger fares, in one case to a level below the corresponding fare by rail. Effective January 1, the United Air Lines, which operate planes to and from New York, Cleveland, Chicago, San Francisco, Portland, Seattle, Spokane, Los Angeles, Dallas and 30 or more other cities made a general and extensive reduction in passenger fares. The transcontinental fare was reduced from $200 to $160; that between New York and Chicago was lowered from $59.50 to $47.95; while the rate between Chicago and the Pacific Coast was cut from $150 to $115. The Ludington Lines, which operate airplanes between New York and Washington, D. C., hourly throughout the day, have also reduced passenger fares, some of the new rates being lower than by rail. Between New York and Washington the oneway rate is $10 and the round-trip fare is $18.50.

Association News

International Railway Maintenance Club

The next meeting of the International Railway Maintenance Club will be at the Hotel Statler, Buffalo, N. Y., on Thursday, February 11. Following luncheon, which will be served at 12:30 p. m., J. R. MacKenzie, district engineer, Canadian National, will present a paper on "Frost Heave." Since the reorganization of the club, a special invitation is being extended each meeting to bridge, building and signal department men.

Maintenance of Way Club of Chicago

Sixty members and guests of the club were present at the dinner on Wednesday evening, January 20, when Armstrong Chinn, chief engineer of the Alton, read a paper on "Getting Along on Your Job." The next meeting of the club will be held on Wednesday, February 17, when Earl Stimson, chief engineer maintenance, Baltimore & Ohio, will address the club on "Looking Into the Future."

Metropolitan Track Supervisors' Club

At the next meeting of the Metropolitan Track Supervisors Club, at Keen's Chop House, 72 West Thirty-Sixth street, New York, at 6 p. m. on February 18, the usual dinner will be followed by the presentation of two papers; one on "The Economical Drainage of Roadbed," and the other on "The Reduction of Labor Turnover Expense Through the Retention of Experienced Men." The first of these papers will be presented by a committee, of which E. E. Crowley, roadmaster, Delaware & Hudson, is chairman, and the second by a committee of which T. E. MacMannis, supervisor, Central Railroad of New Jersey, is chairman. Another feature of the meeting will be motion pictures on a subject of interest to maintenance men.

American Railway Engineering Association

The Committee on Arrangements will meet at Chicago on February 2, at which time final preparations will be made for the convention, which will be held at the Palmer House, Chicago, on March 15 and 16. It is expected that the main feature of this year's meeting aside from the technical sessions, will be a general luncheon at noon on Wednesday for all members who are in attendance.

Bulletin No. 343 for January was mailed on January 22; this will be followed on February 10 with Bulletin No. 344 which will contain the remainder of the committee reports. A final analysis of this year's reports indicates that they approximate in total volume those which were presented last year.

Personal Mention

General

W. G. White, secretary of the Chicago Union Station Company, and formerly engineer maintenance of way of the Erie & Ashtabula division of the Pennsylvania, retired on January 1, at the age of 70 years.

Engineering

H. A. Gerst, assistant bridge engineer of the Great Northern, has moved his headquarters from Spokane, Wash., to Seattle.

Howard C. Forman, a draftsman in the office of the chief engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., has been promoted to assistant engineer on the Cumberland Valley division, with headquarters at Middlesboro, Ky., where he succeeds **F. C. Flynt,** whose death is noted elsewhere in these columns.

Morris Donahoe, who has been appointed division engineer of the Western division of the Alton, with headquarters at Bloomington, Ill., as noted in the January issue of *Railway Engineering and Maintenance,* has been connected with the maintenance of way department of the Alton for 44 years. He entered the service of this company in 1888 as a trackman, being promoted to track foreman with headquarters at Alton, Ill., in 1891.

Morris Donahoe

Eight years later Mr. Donahoe was further advanced to assistant roadmaster, which position he held until 1900 when he was made supervisor of track. He occupied the latter position for the next ten years, at the end of which time he was promoted to division roadmaster. In 1915, Mr. Donahoe was advanced to general roadmaster, with headquarters at Bloomington, Ill. In 1925 he was appointed to the newly-created position of general supervisor of maintenance, in charge of the maintenance of roadway, bridges and buildings and signals, with headquarters at Chicago. In 1930 Mr. Donahoe again assumed the position of general roadmaster, with the same headquarters, which position he held until his recent appointment as division engineer, effective January 1.

W. H. Hulsizer, valuation engineer of the Union Pacific Railroad, with headquarters at Omaha, Neb., has been promoted to valuation officer of the Union Pacific System, succeeding **G. P. Turner,** whose death is noted elsewhere in these columns. Mr. Hulsizer was born on September 25, 1885, at Flemington, N. J. He graduated from Princeton University in 1907, with a degree in civil engineering and until 1910 he engaged in various capacities on building construction work in northern New York and Canada and later on railroad location work. In May

W. H. Hulsizer

of that year, Mr. Hulsizer entered the service of the Union Pacific as a special clerk in the valuation bureau of the engineering department and has been engaged in various capacities either in the latter department or the valuation department since that date. He was appointed valuation engineer of the Union Pacific Railroad in August, 1924, and held that position until his recent promotion.

In a reorganization of divisions on the Lehigh Valley, effective January 1, the six operating divisions of the road have been consolidated into three divisions. The Buffalo division has been extended to include the Auburn division and the west end of the Seneca division to and including Athens, Pa. The Wyoming division has been extended to include the east end of the Seneca division to Athens, and the Lehigh division has been extended to include the New York division. **R. E. Patterson** continues as division engineer of the Lehigh division, with headquarters at Easton, Pa., and **E. J. Cullen** continues as division engineer of the Buffalo division, at Buffalo, N. Y. **A. B. Shimer,** division engineer of the Seneca division, with headquarters at Sayre, Pa., has been appointed assistant division engineer of the Buffalo division, with the same headquarters, and **J. T. Donovan,** division engineer of the New York division, has been transferred to the Wyoming division, with headquarters at Wilkes-Barre, Pa., succeeding **F. N. Loughnane,** who has retired at his own request.

James F. Burns, assistant engineer maintenance of way of the Louisville & Nashville, with headquarters at Louisville, Ky., retired on December 31, after having served the engineering and maintenance of way departments of the L. & N. for 41 years. The position of assistant engineer maintenance of way has been

James F. Burns

abolished. Mr. Burns was born in 1869, at St. Clairsville, Ohio, and was educated in engineering at Ohio State University, from which he graduated in 1891. He entered railway service in the same year as a draftsman in the office of the chief engineer of the Louisville & Nashville. A year later he was appointed masonry inspector on bridge construction and in 1893 he was advanced to assistant engineer on the Memphis line of the L. & N. Mr. Burns served as assistant engineer until 1902, when he was promoted to roadmaster, with headquarters at Lebanon, Ky., later being transferred to Elizabethtown, Ky., where he remained until 1913, when he was advanced to assistant engineer maintenance of way, with headquarters at Louisville. Mr. Burns retained the latter position continuously until his retirement.

Walter P. Whitten, engineer with the claim department of the Great Northern, with headquarters at St. Paul, Minn., has retired after 36 years of service in the engineering and legal departments of this road. **Walter C. Nolting** has been appointed to succeed Mr. Whitten.

Mr. Whitten was born on December 5, 1860, at Newton, Mass. He entered the service of the Great Northern on April 15, 1895, as a draftsman at St. Paul, Minn., being appointed an assistant engineer later in the same year. On March 17, 1903, he was appointed resident en-

gineer on the Eastern division, which position he held until February 1, 1926, when he was transferred to the legal department, as engineer of the claim department. Mr. Whitten retained this position until his retirement.

Arthur L. Davis, principal assistant engineer of the Illinois Central, with headquarters at Chicago, has retired from active service because of ill health, effective January 1. **Maro Johnson,** assistant engineer, at Chicago, has been appointed principal assistant engineer to succeed Mr. Davis.

Mr. Davis had been connected with the engineering department of the Illinois Central for 37 years. He was born at York, Ont., and graduated from the

Arthur L. Davis

Royal Military College, at Kingston, Ont. He began his railway career early in 1894 in the engineering department of the Peoria, Decatur & Evansville, and when that company became a part of the Illinois Central in 1901, he was appointed assistant engineer, with headquarters at Chicago. Later he was advanced to chief draftsman and in May, 1910, he was promoted to office engineer. In June, 1919, Mr. Davis was further promoted to principal assistant engineer, which position he held until his retirement.

Coincident with the consolidation of six operating divisions of the Wabash into three on January 1, a number of changes took place among division engineering officers. In the consolidation of divisions, the Peru and Detroit division were merged under the name of the Montpelier division, while the Springfield division, which recently was consolidated with the Western division, has now become a part of the Decatur division. The Western division has been merged with the Moberly division. **C. A. Johnston,** superintendent of the Detroit division, has been appointed division engineer of the Montpelier division, with headquarters as before at Montpelier, Ohio. **V. R. Hayes** and **S. N. Crowe** will remain as division engineers of the enlarged Decatur and Moberly divisions, with headquarters at Decatur, Ill., and Moberly, Mo., respectively. **H. G. Holloway,** division engineer of the Detroit division, with headquarters at Montpelier, Ohio, has been appointed first assitant engineer of the Decatur division, with headquarters at Decatur. **R. L. Long,** division engineer of the Peru division at Peru, Ind., has been appointed first assistant engineer of the Montpelier division, and **O. A. Lewis,** division engineer of the Western division, at Moberly, has been appointed first assistant engineer of the Moberly division, with the same headquarters.

Thomas Turnbull, engineer maintenance of way of the Western region of the Canadian National, with headquarters at Winnipeg, Man., has retired after having been engaged in railway engineering work in Canada for 51 years. He entered railway service in 1881 with the Canadian Pacific, as a transitman on location and served in this position and as resident engineer on construction until 1889. For two years thereafter he served the Newfoundland government in charge of a location party and on construction work on the Halls Bay railway, returning to the Canadian Pacific in 1891 as assistant engineer, maintenance and construction, of the Western division. In 1897, he was appointed chief engineer of the lines west of Winnipeg of the Canadian Northern (now part of the Canadian National), serving this railway until 1901, when he entered the service of the Dominion government. Mr. Turnbull was appointed assistant chief engineer of the Canadian National in 1904 and in 1910 he was appointed to a similar position on the Hudson Bay Railway, being advanced to chief engineer in 1912. Mr. Turnbull again entered the service of the Canadian Northern in 1913 as assistant chief engineer, the position he was holding at the time of his appointment on January 7, 1919, as engineer maintenance of way of the Western region of the Canadian National.

W. S. Burnett, chief engineer of construction of the Cleveland, Cincinnati, Chicago & St. Louis, has been promoted to chief engineer, with headquarters as before at Cincinnati, Ohio, to succeed **Hadley Baldwin,** who has been appointed special engineer at Cincinnati. The position of engineer of construction has been abolished. Mr. Burnett has a record of many years experience in the railway engineering field, during which time he has been connected with a number of roads. He was born on September 5, 1878, at Montrose, Scotland, and graduated from the East of Scotland Technical College. After completing his education, Mr. Burnett came to the United States and entered railway service as a rodman on the Southern Indiana (now part of the Chicago, Milwaukee, St. Paul & Pacific, being promoted to instrumentman in 1900. In 1904 he was appointed resident engineer on the Chicago Southern (now part of the Chicago & Eastern Illinois). He entered the service of the Big Four in 1906, as a resident engineer, going with the C. M. St. P. & P. in the same capacity two years later. In 1910, Mr. Burnett returned to the Big Four as resident engineer, being promoted to district engineer in 1912 and to engineer maintenance of way at Springfield, Ohio, the following year. Later he was again appointed district engineer at Springfield, and in 1924 he was promoted to engineer of construction with headquarters at Cincinnati. In 1925, Mr. Burnett was further advanced to chief en-

W. S. Burnett

gineer of construction, with headquarters at Indianapolis, Ind., being transferred to Cincinnati a short time later. His promotion to chief engineer became effective on January 15.

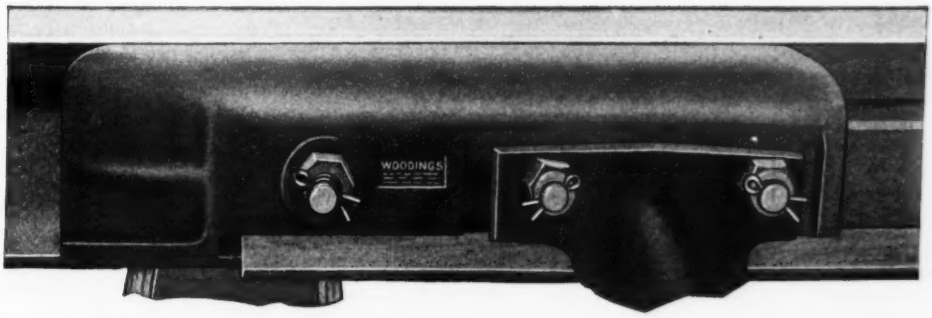
Track

L. P. Lovejoy, assistant engineer on the Wabash, has been appointed supervisor of track, with headquarters at Moulton, Iowa, to succeed **C. E. Fry,** who has been assigned to other duties.

D. C. Hooper, instrumentman in the office of the division engineer of the Canadian National, at Port Arthur, Ont., has been appointed acting roadmaster, with headquarters at Swan River, Man., to succeed **A. G. Ayres,** who has been transferred to the Melville division, with headquarters at Melville, Sask. Mr. Ayres succeeds **A. T. Herbert,** who has been transferred to the Brandon division, with headquarters at Neepawa, Man., to succeed **E. Cheetham,** who has retired.

C. R. Uitts, assistant supervisor on the Philadelphia Terminal division of the Pennsylvania, with headquarters at South Philadelphia, Pa., has been transferred to the Philadelphia division, with headquarters at Lemoyne, Pa., to succeed **M. S. Smith,** who has been appointed acting assistant supervisor at Perryville, Pa. **J. R. Stam,** inspector in the office of the chief engineer maintenance of way, has been promoted to supervisor on the Middle division, with headquarters at Hollidaysburg, Pa., succeeding **J. J. Clutz,** who has been transferred to the New York division, with headquarters at Jamesburg, N. J. **A. W. Miller,** assistant supervisor, with headquarters at Millersburg, Pa., has been transferred to Lock Haven, Pa. **R. P. Hebart,** assistant supervisor on the Philadelphia Terminal division, has been transferred to the office of the division engineer on the Baltimore division. **R. W. Speidel,** assistant on the engineer corps of the Cumberland Valley division,

WOODINGS
Switch Point Protector



A Real Switch Point Protector made of High Grade
MANGANESE STEEL

This device has met with a remarkable response within a short time. More than thirty railroads have made installations. During these times, particularly, this device should interest the railroads. Convert your worn points into manganese tipped points. We welcome the opportunity to demonstrate.

F W & T

WOODINGS FORGE & TOOL CO.

WORKS AND GENERAL OFFICES

VERONA, PENNA.

with headquarters at Chambersburg, Pa., has been appointed acting supervisor on the Schuylkill division, with headquarters at Norristown, Pa.

The announcement in the January issue of the promotion of **P. W. Early,** assistant supervisor of track on the Middle division, with headquarters at Newport, Pa., to supervisor on the Baltimore division, with headquarters at York, Pa., was in error. Instead Mr. Early was transferred as assistant supervisor to Parkton, Md.

A. Asplund, assistant roadmaster on the Fourth subdivision of the Ashland division of the Chicago & North Western, with headquarters at Ironwood, Mich., has been promoted to roadmaster of the Second subdivision of the same division with headquarters at Antigo, Wis., where he succeeds **H. G. Van Gorder,** who has retired.

Mr. Asplund has spent his entire railway career of more than 22 years on the Ashland division of the North Western. He was born on March 30, 1894, at Ironwood, Mich., and after securing an education in the public schools of that place he entered the service of the North Western on August 29, 1909, as a trackman. Two years later he was promoted to assistant track foreman and on August 27, 1912, he was further advanced to track foreman. Mr. Asplund remained in the latter position until April 1, 1928, when he was again advanced to assistant roadmaster, which position he held until his recent promotion to roadmaster, effective January 1.

Thomas Reagan, supervisor on the Northern division, main line, of the Delaware, Lackawanna & Western, with headquarters at Scranton, Pa., has been appointed roadmaster on the same division, with the same headquarters, succeeding **Dan Duffy,** who has retired. Mr. Reagan was born on April 12, 1883, at Plymouth, Pa. He entered railway service with the Lackawanna on March 26, 1900, and in July, 1915, he left the railroad to become superintendent for the Porter Bros. Construction Company. He returned to the Lackawanna on September 20, 1919, as an extra gang foreman on the Bloomsburg division, and on April 1, 1920, he was promoted to supervisor on the Northern division, main line, which position he was holding at the time of his recent promotion to roadmaster.

In connection with the consolidation of divisions on the Lehigh Valley, as noted in detail elsewhere in these columns, **M. J. Murphy,** supervisor of track at Wilkes-Barre, Pa., has been retired on his own request and his territory has been placed under the jurisdiction of **H. F. Reilly** supervisor at Coxton, Pa. **P. Christiansen,** supervisor on the Auburn division, with headquarters at Auburn, N. Y., has also retired on his own request. **J. E. Pierce,** supervisor at Cortland, N. Y., has been transferred to Auburn and his territory extended to include that over which Mr. Christiansen had jurisdiction. **C. Hewitt,** supervisor at Sayre, Pa., has been appointed general yard foreman at that point, and his former territory has been placed under the jurisdiction of **W. W. Crowley,** supervisor at Geneva, N. Y. On March 1, Mr. Crowley will move his office to Sayre.

L. Barnes, division roadmaster of the Pasco division of the Northern Pacific, with headquarters at Pasco, Wash., has been transferred to the St. Paul division, with headquarters at Minneapolis, Minn. **J. A. Bryan,** division roadmaster of the Idaho division, with headquarters at Spokane, Wash., has been appointed roadmaster on the Rocky Mountain division, with headquarters at Missoula, Mont. **C. H. Burgess,** division roadmaster of the Dakota division, with headquarters at Jamestown, N. D., has been transferred to the Rocky Mountain division, with headquarters at Missoula. **H. C. Rupple,** division roadmaster of the Seattle division, with headquarters at Seattle, Wash., has been appointed roadmaster on the Tacoma division, with the same headquarters, to succeed **W. A. Bracken,** who has been transferred to Missoula. **B. F. Segur,** district roadmaster, with headquarters at Spokane, Wash., has been assigned to other duties. **C. F. Nelson,** division roadmaster of the Montana division, with headquarters at Livingston, Mont., has been appointed roadmaster on the Tacoma division, with headquarters at Tacoma, Wash. **H. W. McCauley,** roadmaster at Tacoma, has been transferred to Mandan, N. D., where he succeeds **R. E. Mattson,** who has been transferred to Lester, Wash., succeeding **A. H. Smyth,** who has been assigned to other duties. **A. E. Perlman,** roadmaster, with headquarters at Sandpoint, Idaho, has been transferred to Staples, Minn. **D. A. Thomson,** roadmaster at Staples, has been transferred to Spokane, while **H. Olson,** also roadmaster at Staples, has retired. **R. A. Sharwood** and **R. L. Stewart,** roadmasters at Fargo and Tacoma, respectively, have been assigned to other duties. These changes have taken place in connection with a consolidation of divisions on the Northern Pacific on January 1 in which the Dakota, Montana and Seattle divisions were abolished and consolidated with other divisions.

Bridge and Building

J. K. Bonner, supervisor of piers and buildings of the New York Central, at New York, has been appointed supervisor of bridges and buildings of the River division, with headquarters at Weehawken, N. J.

Following a recent rearrangement of divisions on the Wabash in which the Peru division was abolished, **G. M. Johnson,** supervisor of bridges and buildings of that division, with headquarters at Peru, Ind., has been transferred to the Montpelier division, at Montpelier, Ohio.

As a result of the consolidation of divisions on the Lehigh Valley, in which the New York, Seneca and Auburn divisions were absorbed by the Lehigh, Wyoming and Buffalo divisions, **F. W. White,** supervisor of bridges and buildings on the old Seneca division, has been appointed to the same position on the Wyoming and Buffalo divisions, with headquarters, as before, at Sayre, Pa. **J. S. Smith,** supervisor of bridges and buildings on the old Wyoming division, at Wilkes-Barre, Pa., and **M. J. McCoskey,** supervisor of bridges and buildings on the Buffalo division, at Buffalo, N. Y., have been appointed general foremen at the same points. **J. P. Hofecker,** supervisor of bridges and buildings on the old Auburn division, with headquarters at Auburn, N. Y., has retired on his own request. **R. E. James** remains as supervisor of bridges and buildings of the Lehigh division, with headquarters at Easton, Pa.

A. Hanson, supervisor of bridges and buildings of the Montana division of the Northern Pacific, with headquarters at Livingston, Mont., has been transferred to the Yellowstone division, with headquarters at Glendive, Mont., where he succeeds **A. F. Ainslie,** who has been transferred to Pasco, Wash. Mr. Ainslie succeeds **H. Espeland,** who has been appointed assistant supervisor of bridges and buildings at Missoula, Mont. **E. J. Johnson,** supervisor of bridges and buildings of the Dakota division, with headquarters at Jamestown, N. D., has been assigned to other duties. Following a consolidation of divisions, the positions of supervisor of bridges and buildings of the Montana and Dakota divisions have been abolished and these divisions have been merged with other divisions.

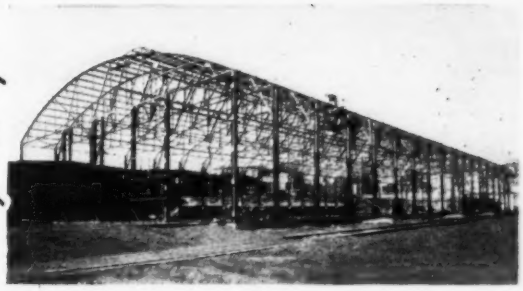
Water Service

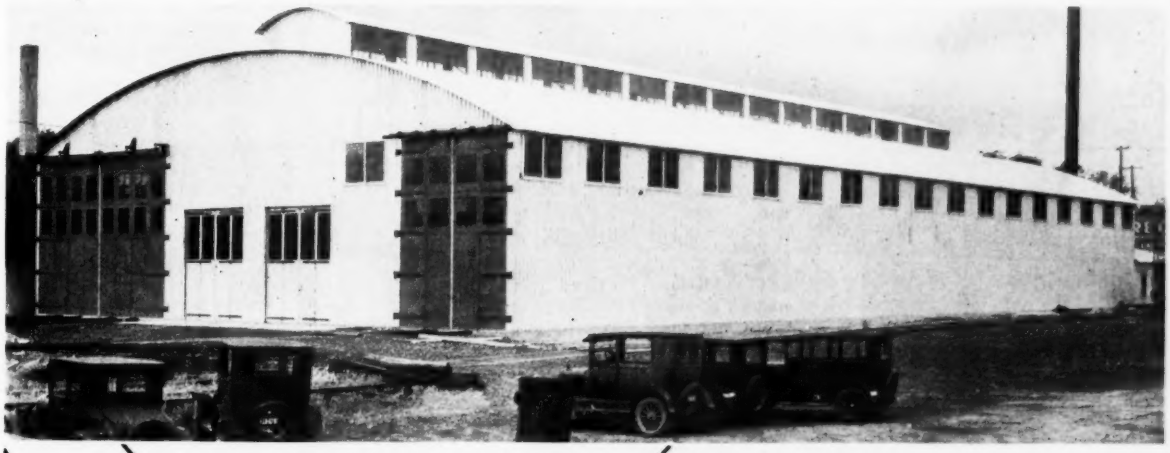
J. A. Russell, engineer of water service of the Pennsylvania, with headquarters at Philadelphia, Pa., has been appointed to the newly-created position of manager of water service with headquarters at the same point. **H. H. Russell,** superintendent of the Williamsport division, with headquarters at Williamsport, Pa., has been promoted to engineer of water service, with headquarters at Philadelphia, to succeed J. A. Russell.

H. H. Russell was born on March 10, 1872, at Jersey Shore, Pa., and was also educated at the University of Pennsylvania, from which he graduated in 1895. In May of the same year he entered railway service as a rodman in the office of the general superintendent of the Pennsylvania. Three years later he left railway service to join the United States army, where he remained until July, 1899, when he returned to the service of the Pennsylvania as a transitman in the office of the general superintendent. In January, 1900, Mr. Russell was promoted to assistant supervisor, with headquarters at Parkton, Md., being transferred successively to the Renovo, Philadelphia and Pittsburgh divisions. In April, 1902, he was promoted to supervisor on the Columbia branch, with headquarters at Columbia, Pa., later being transferred to the Philadelphia Terminal division, and thence to the Maryland division. Mr. Russell was further advanced to division engineer of the Allegheny division in November, 1907, being transferred to the Middle division in June, 1913, and then to the Pittsburgh division in April, 1917.

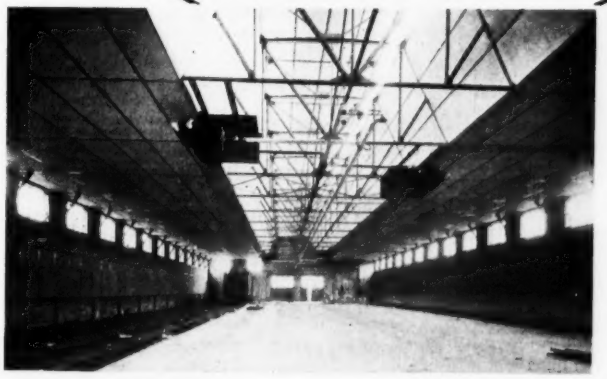
MADE ENTIRELY OF STEEL

BUTLER

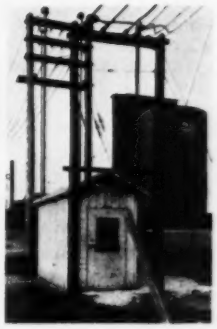




READY-MADE STEEL BUILDINGS



At the top right is a photograph of the structural steel frame which carries the C. B. & Q. Fruit House. Its members are designed to give the greatest strength per pound of steel and fabricated in units such as to facilitate quick assembly. The large photograph shows the finished building with the panel corrugated wall and roof sections bolted into a finished exterior. The special Butler panel corrugation multiplies sheet steel strength fourfold over ordinary corrugating. The interior view above the inside insulation is accomplished with Nu-wood, a commercial wall board. Insulation and heating facilities are such as to maintain a 50 degree temperature in coldest weather.



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Six months later he was transferred to the operating department as assistant superintendent of the same division, being promoted to superintendent of the Williamsport division in September, 1918. He was holding the latter position at the time of his recent promotion to engineer of water service, effective January 1.

J. A. Russell was born on February 6, 1887, at Philadelphia, and was educated at the University of Pennsylvania. He entered the service of the Pennsylvania Water Companies on July 1, 1913, as an assistant engineer, and on March 1, 1925,

J. A. Russell

he was promoted to engineer of water companies. Four years later Mr. Russell was advanced to engineer of water service of the Pennsylvania, with headquarters at Philadelphia, which position he held until his recent appointment as manager of water service which also became effective on January 1.

Obituary

G. P. Turner, valuation officer of the Union Pacific System, with headquarters at Omaha, Neb., died of a heart attack on January 9, in that city.

William F. Tye, chief engineer of the Canadian Pacific from 1904 to 1906, and well known in construction circles throughout Canada, died on January 9, at the age of 71, in Paris, France.

F. C. Flynt, assistant engineer on the Cumberland Valley division of the Louisville & Nashville, with headquarters at Middlesboro, Ky., died on December 19, at his home at that point.

E. J. Auge, who retired in 1925 as chief carpenter of the Southern Minnesota division of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Austin, Minn., died at Minneapolis, Minn., on December 15.

Henry T. Porter, who retired on May 1, 1931, as chief engineer of the Bessemer & Lake Erie, died on January 11 at his home in Greenville, Pa., after several months of ill health. He was 73 years of age. A biographical sketch and a photograph of Mr. Porter was presented in the June, 1931, issue of *Railway Engineering and Maintenance*, page 574.

Supply Trade News

General

The Stanley H. Smith Company has been appointed railroad sales agent at Cleveland, Ohio, for **The Gardner-Denver Company,** Quincy, Ill.

The Industrial Brownhoist Corporation, has moved its general offices from Cleveland, Ohio, to Bay City, Mich., but will retain a district sales office at 4403 St. Clair avenue, Cleveland.

The Railroad Materials Corporation, 30 Church street, New York, has been appointed railroad representative for the **Electric Arc Cutting & Welding Company,** Newark, N. J., manufacturers of electric welding equipment and welding rods.

The Medusa Portland Cement Company, Cleveland, Ohio, has purchased the entire output of rust-proof coatings, sold under the name of Rust-oy, and kindred protective coatings of the **Studebaker Chemical Company,** Elyria, Ohio.

The Hopkins Company, Chicago, has completed an arrangement with the **Massey-Harris Company,** Racine, Wis., to handle the railroad sales of the latter company's general purpose four-wheel-drive tractor, with all railways having purchasing agents at Chicago, Detroit, Mich., Cleveland, Ohio, and Cincinnati, St. Louis, Mo., Omaha, Neb., Dallas, Tex., and Houston.

The Nordberg Manufacturing Company, Milwaukee, Wis., has received an order from the Chesapeake & Ohio, for eight Nordberg spike-pullers and seven adzing machines, with which the railroad is equipping all of its rail-laying gangs in preparation for the 1932 rail-laying program. This order follows the experimental use by the C. & O. in its 1931 program of two Nordberg adzing machines and two spike pullers.

The Philip Carey Company, Cincinnati, Ohio, has made arrangements with the **American Hair & Felt Company,** Chicago, for the sale of its products to railroads and railroad equipment companies through the latter concern, under the direction of **James C. Younglove,** general manager of the transportation and government division of the American Hair & Felt Company and the Dry-Zero Corporation, with headquarters at Chicago.

Personal

W. J. Dukes, formerly representative of the Climax Engineering Company, has been appointed manager of engine sales in the railroad and utility fields for the **Caterpillar Tractor Company,** Peoria, Ill.

P. H. Gilleland, manager of the Railroad division of **Fairbanks, Morse & Company,** Chicago, resigned on December 31, to take an extended vacation trip before returning to active business.

Frank J. Reagan has been appointed western representative of the Railway Appliances division of the **American Fork & Hoe Co.,** Cleveland, Ohio, with headquarters at Chicago, to succeed **Robert E. Keough,** deceased. Mr. Reagan was previously located at Minneapolis, Minn., and will represent the American Fork & Hoe Co. in both territories.

F. N. Wardwell, consulting engineer for the **General Cable Corporation,** is now located in the general office of that company at 420 Lexington avenue, New York. Mr. Wardwell was formerly located at Rome, N. Y.

J. R. C. Hintz has been appointed district manager, railway sales department, **Detroit Graphite Company,** with headquarters at 386 Fourth avenue, New York. Mr. Hintz was formerly with the Detroit Graphite Company as railway sales representative and later joined Benjamin Moore & Company, New York, in the same capacity.

John H. Trent has been appointed general manager of the transportation and government department, western and southwestern divisions of the **Johns-Manville Sales Corporation,** New York. Mr. Trent will have his headquarters at St. Louis, Mo. He was born in Meade county, Ky., and was educated in the public schools of Paducah, Ky. In 1901 he entered the service of the Illinois Central and after serving in the mechanical and stores departments at Burnside shops, Chicago, he became storekeeper at Water Valley, Miss., subsequently serving at Memphis, Tenn., and Paducah, Ky. Mr. Trent has been connected with the Johns-Mansville Sales Corporation for the last 25 years.

C. M. Harris has been appointed sales manager of the Philadelphia territory of the **Louisville Frog, Switch & Signal Co.,** Louisville, Ky., with headquarters at Philadelphia, Pa. He entered railway service in 1901 as a special apprentice on the Pennsylvania at Wellsville, Ohio, and in the following year he became a motive power inspector on the Baltimore & Ohio. Two years later he was appointed assistant master mechanic at the Mt. Clare shops, and in 1907 he was appointed master mechanic for the Washington Terminal Company, Washington, D. C. In December, 1916, he resigned to become sales engineer in railway industrial work for the Westinghouse Electric & Manufacturing Co., which position he held until October, 1920, when he was elected vice-president in charge of operation of the Hagerstown & Frederick Railway Co. He held this position until November 15, 1928, when he resigned to become manager of transportation, stores and building management of the Philadelphia Electric Company. On December 1, 1930, he returned to the employ of the Westinghouse Electric & Manufacturing Co. where he engaged in special engineering studies on heavy traction work, including the Pennsylvania electrification, until June 1, 1931.

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The First Locomotive
1769

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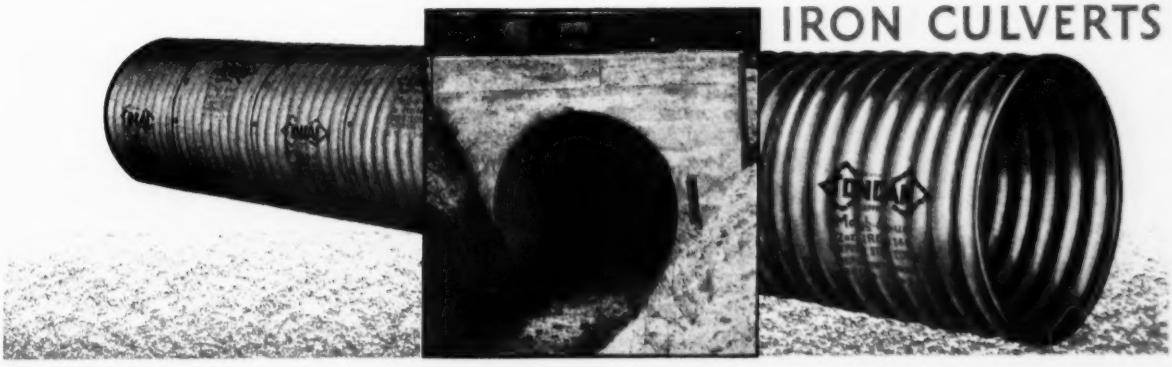
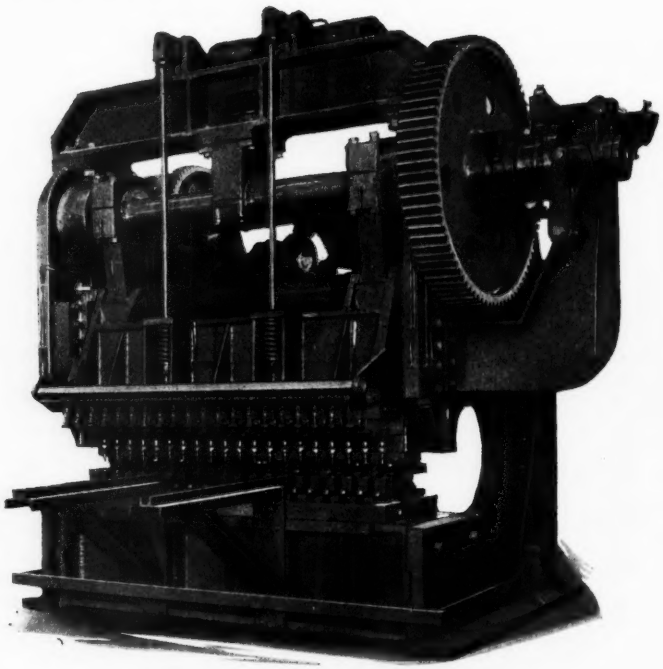


MODERN METHODS



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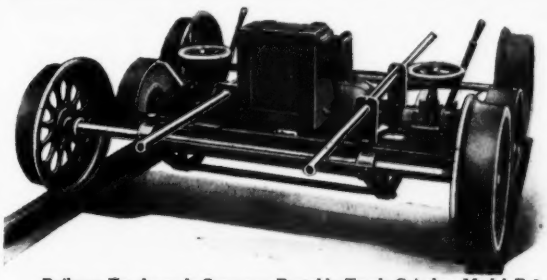
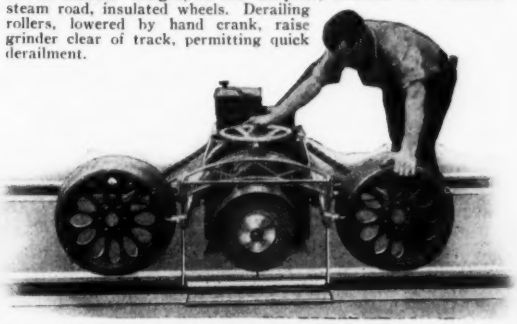
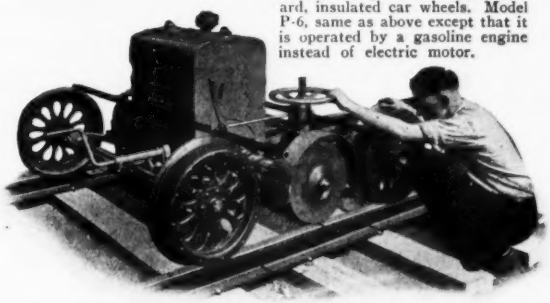


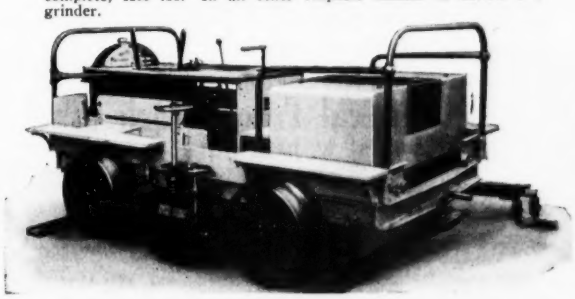
Railway Track-work Company Portable Track Grinder, Model P-2
Two grinding heads operating independently on either rail. Electric motor driven, 5 h.p., 2850 r.p.m. Grinding wheel, 12-in. diameter, operates at 9000 surface ft. per min. Grinding wheel feed regulated by hand wheel. Grinds gauge line or outside of rail as desired. Weight, 900 lbs. complete, mounted on 4 standard steam road, insulated wheels. Derailing rollers, lowered by hand crank, raise grinder clear of track, permitting quick derailment.



Railway Track-work Company Portable Track Grinder, Model P-3
Grinding wheel operates on either rail. Single throw hand lever operates a jack enabling operator to swing machine for grinding opposite rail. Grinding wheel feed regulated by hand wheel. Grinds gauge line or outside of rail. Electric motor driven, 3 h.p., 3000 r.p.m. 12-in. grinding wheel operates at 9500 surface ft. per min. Quickly adjusted roller permits speedy, one-man derailing. Weight, 530 lbs. complete on three standard, insulated car wheels. Model P-6, same as above except that it is operated by a gasoline engine instead of electric motor.



Railway Track-work Company Portable Track Grinder, Model P-4
Operated by 12 h.p., 4 cyl. gasoline engine, 1500 r.p.m. Ingenious hand crank starter makes it impossible to injure operator. Weight complete, 1200 lbs. In all other respects similar to Model P-2 grinder.



Railway Track-work Company Portable Reciprocating Grinder, Model P-7
Propelled and operated by 40 h.p. Ford Industrial gasoline engine. An economical machine for surfacing joints in new track. Grinds by reciprocation instead of rotation. Produces a smooth surface, maintains original rail contour, removes minimum metal. No danger of damaging rail. Two grinding blocks, on each rail make 200—3½-in. strokes per min. Special rollers and frame for quick derailing. Weight approximately 3600 lbs. complete, with four standard car wheels, insulated.

New economies

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For grinding of joints built up by welding, for finishing joints in new track.

—designed specifically for steam road track maintenance

—by the world's headquarters for track grinding equipment

—based on more than a decade of experience in this particular field.

—proven in service as efficient, economical and satisfactory in every respect.

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Railway Track-work Co.

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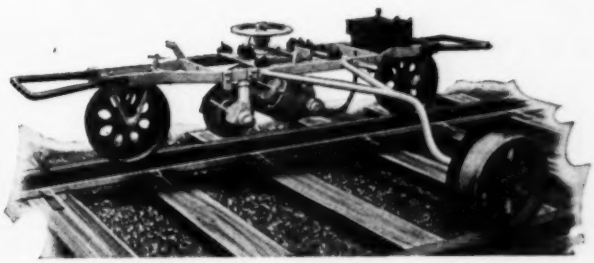
Descriptive literature on request



Railway Track-work Company Portable Electric Track Grinder, Model P-8
Two standard car wheels resting on one rail, carry entire machine. Outrigger rests on opposite rail. Unshipping outrigger permits placing grinder on neutral ground to pass train. 3 h.p. Electric motor, 3450 r.p.m., operates 10-in. grinding wheel at 9000 surface ft. per min. Wheel adjustable laterally and vertically. May be reciprocated with a 16-in. stroke. Flexible shaft carries 6-in. grinding wheel for beveling joints after welding. Weight 400 lbs. —355 lbs. without the outrigger.

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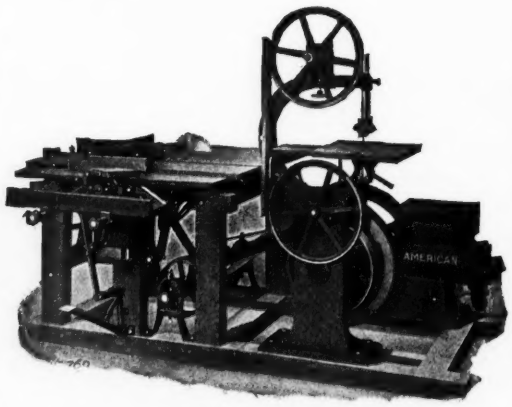
COST CUTTERS



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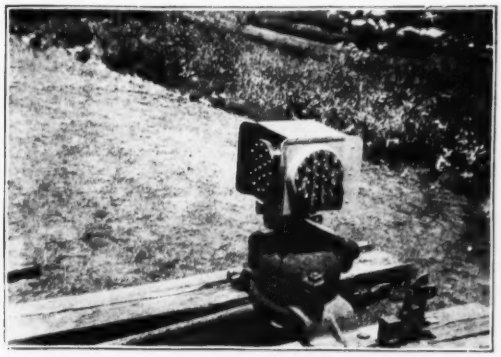

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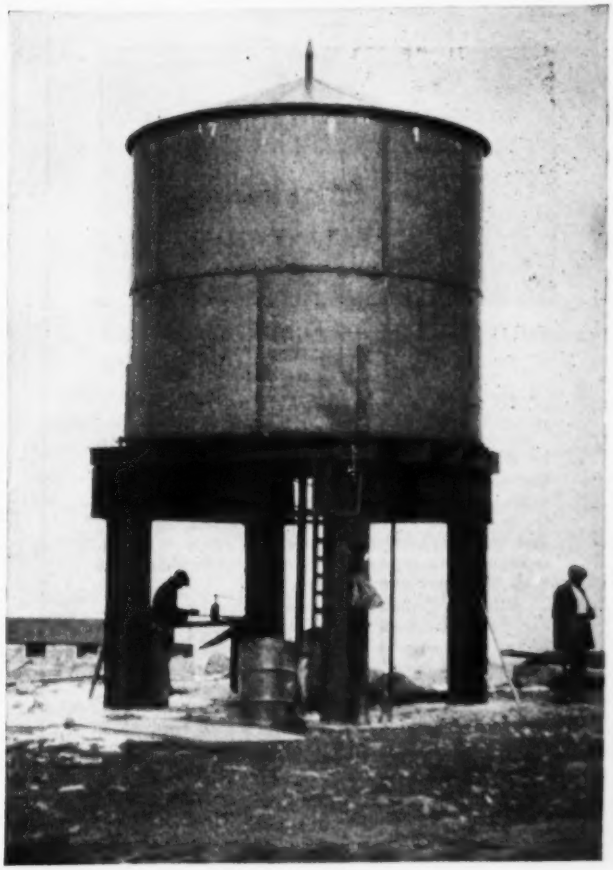

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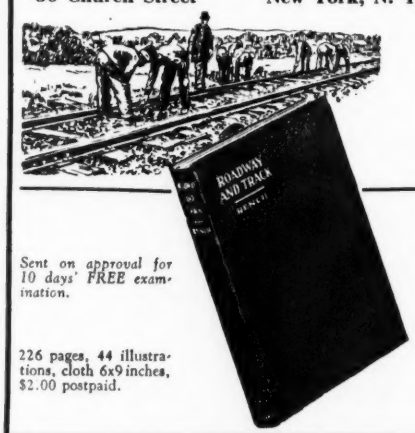

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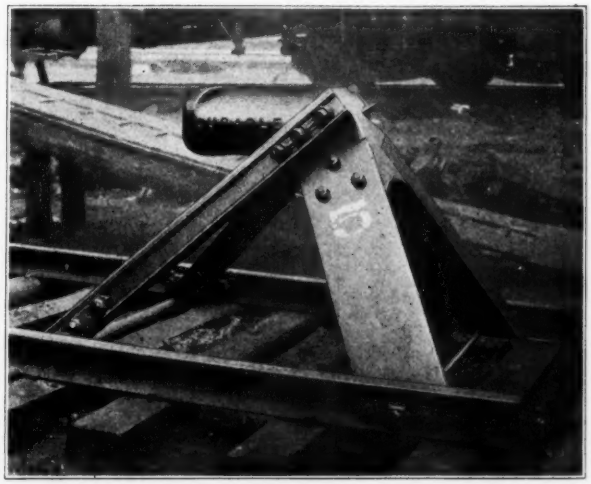

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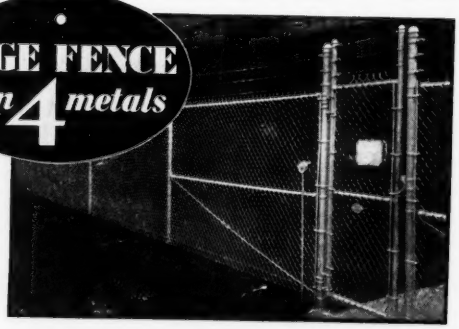

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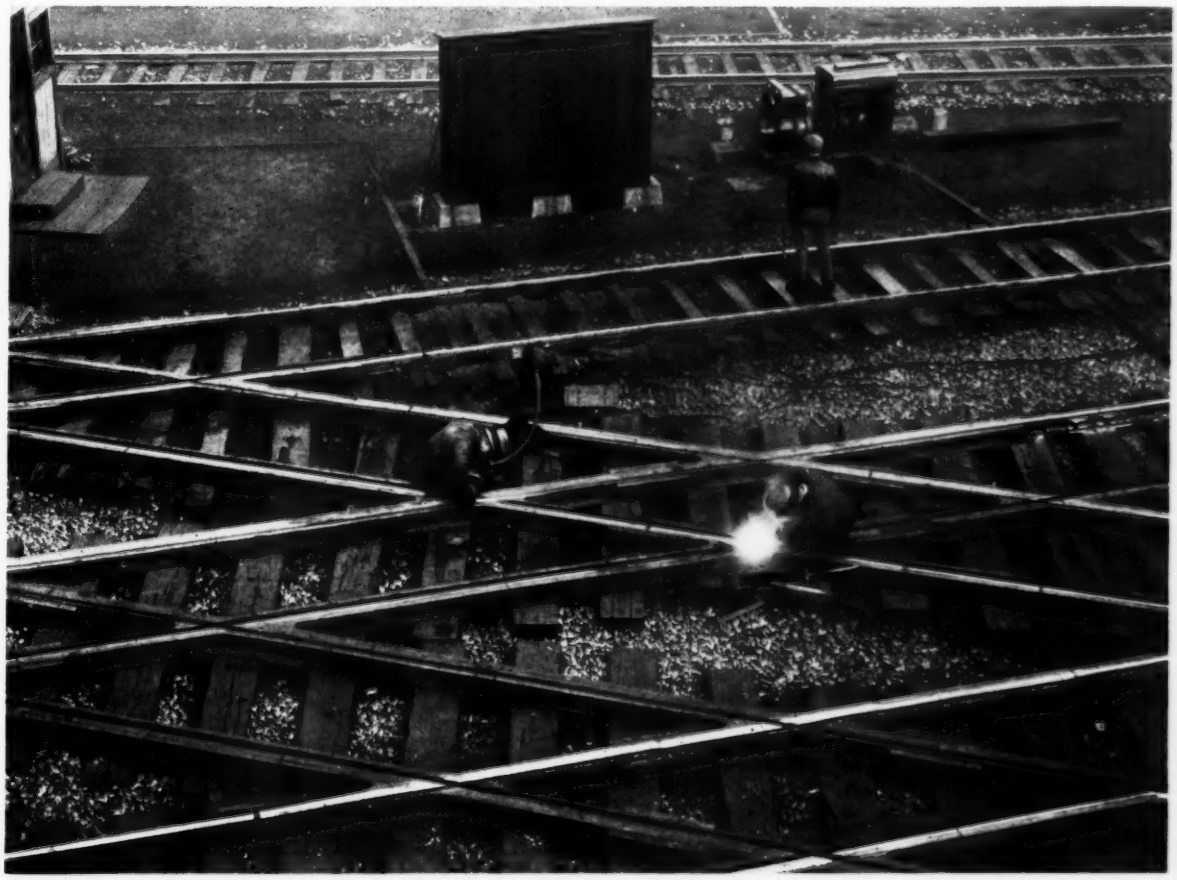

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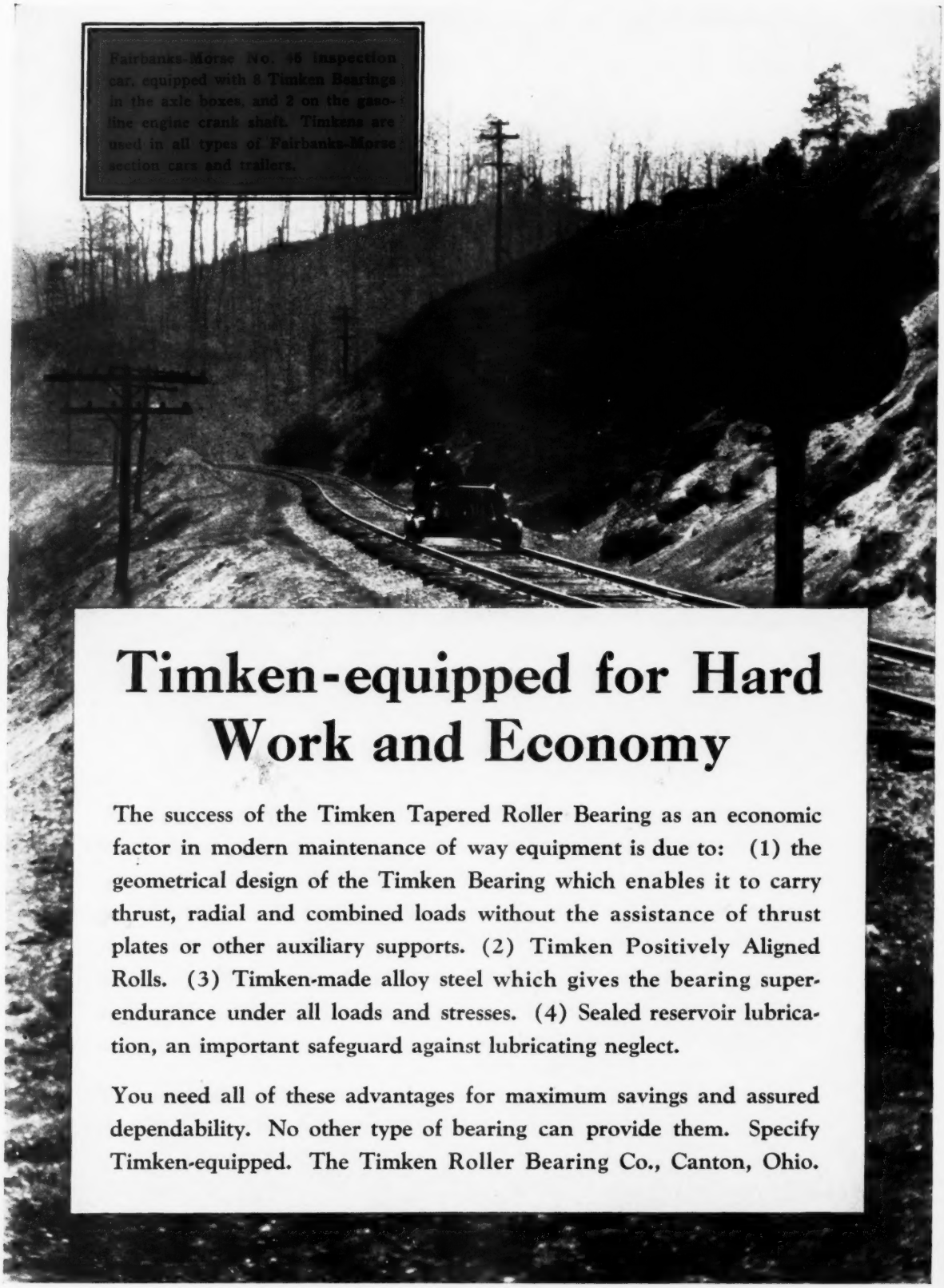
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